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NOVEMBER 1998

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MACWORLD EXPERT STORAGE GUIDE

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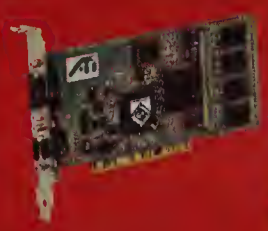

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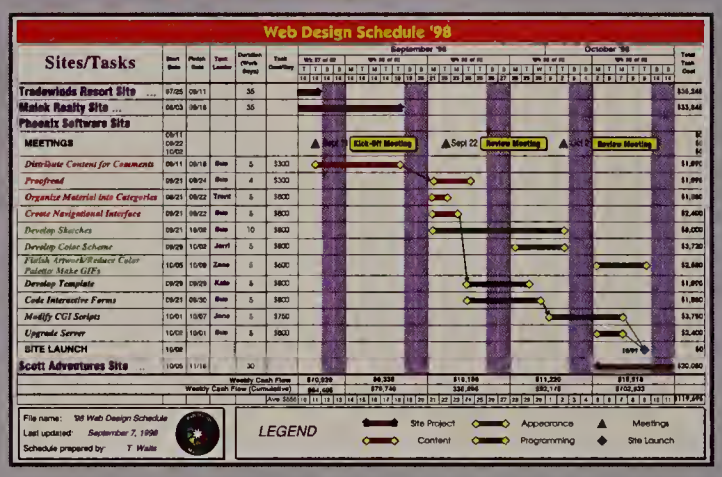

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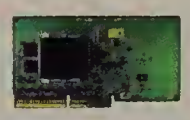

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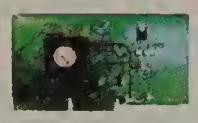

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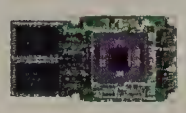

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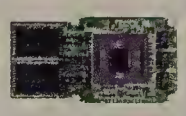

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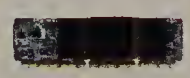

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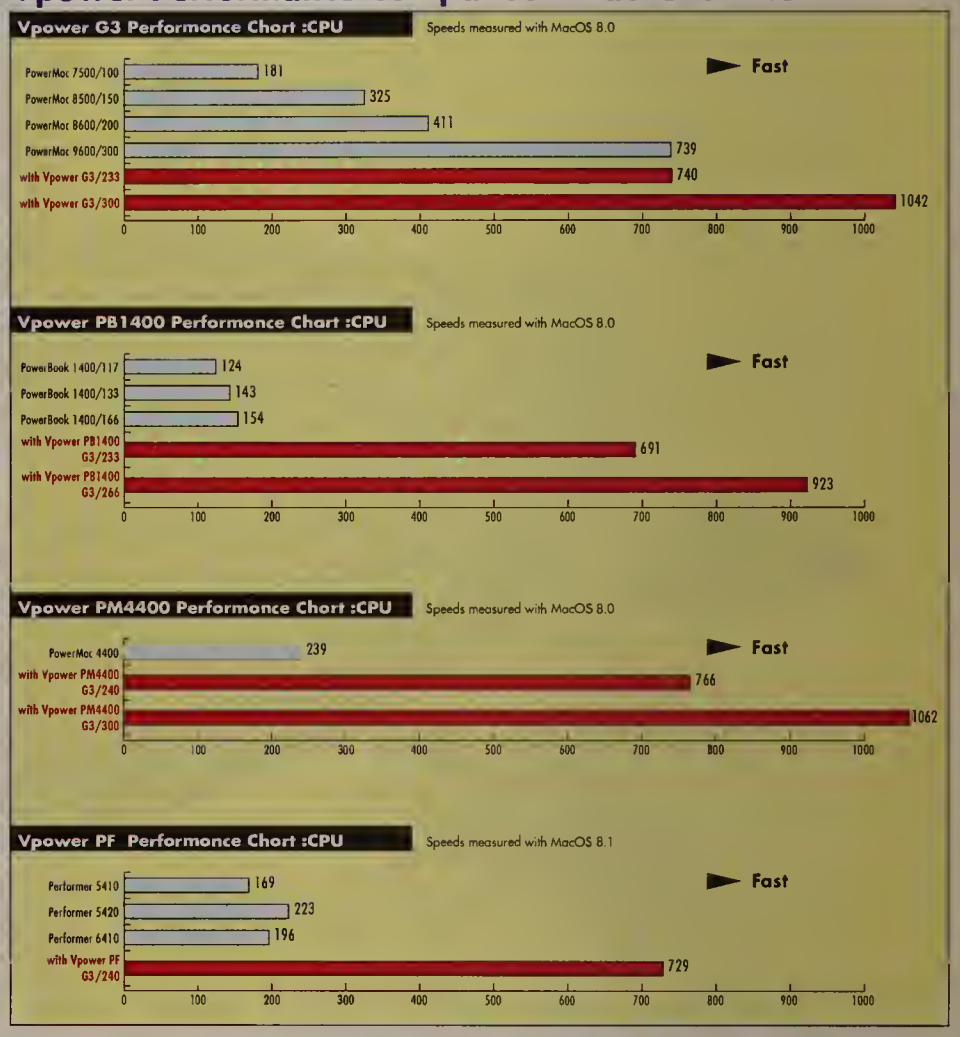
Vpower Performance Comparison MacBench 4.0



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Vpower G3/233	Power Mac 7300,7350,7500,7600,8500,8550,8600,9500 UMAX S900,S910	G3/233MHz	512KB/117MHz	$ 449
Vpower PB 1400 G3/233	Power Book 1400	G3/233MHz	512KB/117MHz	$ 699
Vpower PB 1400 G3/266	Power Book 1400	G3/266MHz	1MB/133MHz	$ 1,099
Vpower PM 4400 G3/240	Power Mac 4400 Motorola Star Max 3000,4000	G3/240MHz	512KB/120MHz	$ 599
Vpower PM 4400 G3/300	Power Mac 4400 Motorola Star Max 3000,4000	G3/300MHz	1MB/150MHz	$ 1,099
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Letters

Left Out of OS X

I THINK APPLE'S DECISION TO HAVE Mac OS X ("The X Factor," August 1998) run only on Apple's G3 and newer machines is a mistake—and I'm not alone in this perception. Professional users needing six-slot machines had no choice over the past year but to buy Power Macintosh 9600's (or clones like the Umax S900) instead of the three-slot G3's. Now these six-slot computers—expensive, top-of-the-line models in 1997 and 1998—will be excluded from OS X in 1999.

The primary technical virtues of Mac OS X—protected memory, preemptive multitasking, and symmetric multiprocessing—are most important to those same professional users. Has it escaped Apple's notice that these features are currently available in Windows NT? As Apple appears to have decided to render obsolete the investments users have made in Apple's top-of-the-line equipment, many Mac professionals might simply defect and buy Windows NT machines.

And what of people like myself, a professor at a small college where new computer purchases are expected to remain viable for several years? I argued last year for the continued viability of the Mac and recommended the purchase of new Macs, all of which will now be excluded from OS X. Under these circumstances, my present Mac might be my last and I may not continue recommending Apple products.

STEPHEN SIEGEL
Bennington, Vermont

Palm-Size Power

I WAS JUST STARTING TO LOOK around for alternatives to replace my Newton when your August 1998 issue

arrived. Thank you, David Pogue and the staff at *Macworld*, for the PalmPilot feature ("Mac's Best Friend"). What perfect timing!

JOHN W. DARRAH
Panama City, Florida

DAVID POGUE STATES IN HIS PalmPilot article that Claris Organizer can't synchronize between a PowerBook and a desktop Macintosh. Last time I checked, Organizer synched perfectly well with my PowerBook, via Organizer's Synchronize command under the File menu. Has this feature been removed?

OMAR SHAHINE
New York, New York

Omar, you're absolutely right. Do you have a pen? Take my article and cross out the words, "and can't synchronize between a PowerBook and a desktop Mac." That oughta do it.
—David Pogue

Mac OS 8.5 Feedback

THE MAC OS 8.5 PREVIEW ("A FIRST Look at Mac OS 8.5," August 1998) mentioned that OS 8.5 includes more integration with the Web through the Find command—but I'd also like to see FTP integrated into the Mac OS. I would like to be able to choose a command from the File menu; type in a server name, user ID, and password; and access an FTP server like a regular volume. Using FTP from the Finder would be so convenient: you could edit a file on a server directly, and the Finder would download it to memory and upload it when you save it. Connections to the Internet are getting faster, so eventually the average user might not even notice a speed difference between connecting to an FTP server versus an internal hard drive.

EVAN JENKINS
Minneapolis, Minnesota

IN AUGUST'S MAC OS 8.5 FEATURE, the author states that the current Mac OS Find File can't search for text inside documents. Not true—by holding down the option key when clicking on the pull-down menu of search criteria, you can search by contents and three additional criteria.

DAVID RAVETTI
Pittsburgh, Pennsylvania

Music to Our Ears

I'M A COMPOSER AND MUSIC teacher, and I really appreciate Christopher Breen's reviews of music and sound software in the August issue

continues

JEFF NEUMANN

CORRECTIONS

- *Both Web-server graphs in "Web Servers"* (Reviews, *September 1998) should be in units of ten thousands, not millions. Personal Web Sharing, for example, receives approximately 30,000 hits per day.*

- *We erroneously stated that the iXMicro ix3D Ultimate Rez card doesn't fit into the Umax C500 ("Quick on the Draw," August 1998). The card does fit into the lower of the two slots of that model.*

- *Myth does not support RAVE mode, only Glide mode ("Quick on the Draw," August 1998). Also, ATI's Xclaim VR does not support 1,600-by-1,200-pixel resolution; its maximum 24-bit resolution is 1,280 by 1,024 pixels in the 8MB card and 1,152 by 870 in the 4MB card.*

("Digital-Audio/MIDI Sequencers" and "MIDI Accompaniment Software"). The reviews in *Macworld* remind the Mac-using public why the Mac remains the dominant platform for sound and music production. I often worry that, with the emphasis on the Mac as a desktop publishing platform, sound and music get left out of the loop. The music industry is huge, and the Mac is a big part of it. Please maintain the sound-and-music presence in *Macworld.* Good job, Chris.

MICHAEL T. ANGELL
Birmingham, Alabama

Photoshop 5.0 Flaws

DEKE McCLELLAND'S BALLYHOO about Adobe Photoshop 5.0 brushes aside two serious flaws that make version 5.0 a disaster (*Reviews*, August 1998).

He states that version 5.0's color management provides more "consistent" color. His contention that the color shift "is unlikely to damage most images" created in earlier versions of the program would be laughable if I didn't recoil at the mutilation of corporate logos and could forget about the Netscape palette. Images may appear to be unchanged from their earlier versions while viewed within Photoshop 5.0, but they appear substantially altered in Equilibrium DeBabelizer, Netscape Navigator, and Microsoft Internet Explorer. Since the manual doesn't warn about this, many designers initially panicked. Those who didn't send their upgrade boxes right back were relieved to receive fixes circulated by beta-tester Craig Hockenberry.

McClelland seems to think this is the price for image integrity between a PC and a Mac and between Adobe Illustrator and Photoshop. Given that Web designers using Illustrator 7 are taking advantage of Adobe's long-overdue RGB support in that program, this seems a bit silly. Furthermore, any Web designer thinking about a PC audience has already set his or her monitor to Uncorrected Gamma.

A second and equally serious hazard of the program is the text-editing "upgrade." From my experiences and those of several colleagues, Photoshop 5.0 distorts a variety of fonts, including Univers, Futura, and Eurostile. We're not talking about arcane Emigre fonts with funky PostScript needs. These are from the Adobe library, running on Adobe Type Manager 4.0.

I think experienced designers should stick with Photoshop 4.0.

JACK E. TAYLOR
New York, New York

Photoshop's changing of Web-safe palettes is a commonly voiced criticism, but the related problems are easily avoided. First, with one command, you can instruct Photoshop to open any image unchanged, as I detailed in my July 1998 feature, "Photoshop Pumps Up." Second, the RGB translation is only relevant to RGB images. Web-safe images are typically indexed to 8-bit color and therefore are not eligible for Photoshop 5's automated color-space conversions. I recommend in both my July feature and August review that users change the default color settings. Craig Hockenberry and I have traded e-mails about these issues, and while I think his input is interesting, I don't entirely agree with his recommendations. Craig has posted some of our discussions on his Web site, www.furbo-filters.com.

Web folks don't need to set their monitors to Uncorrected Gamma with Photoshop 5. You can work in the "correct" 1.8 gamma space (the prepress standard) and preview images in RGB space on the fly directly inside Photoshop. If you ask me, that's an improvement.

The text-kerning problem is a legitimate issue, as I've heard similar complaints from several users. It's not certain whether the kerning problem is related to any specific font, or if it's simply a by-product of permitting manual kerning in a bitmapped program. But kerning issues are hardly disastrous—I would characterize them as pesky.

As for version 4 nostalgia, the main enhancement to that version was a revised interface that put the program more in agreement with Illustrator 7 and Adobe PageMaker 6.5. Photoshop 4.0 was good but did not shine half as brightly as Photoshop 5.0.—Deke McClelland

Sounding Better

IN *MACWORLD*'S RECENT ARTICLE on using QuickTime 3.0 to compress audio, Christopher Breen suggests downsampling audio to 22.05kHz or 11.025kHz when compressing it for low-bandwidth Web connections with the QDesign Music Codec ("Slim Down Sound for the Web," *Create*, August 1998). Because you select the data rate of your audio file through the Options command in the QDesign codec, changing the sampling rate will have no effect on the final file size and will actually degrade your audio. In fact, QDesign recommends that you always use 16-bit, 44.1kHz audio with its codec for optimal quality. If you need a smaller file size, just use a lower data rate.

NAVARRO PARKER
San Diego, California

You're correct—it is indeed a better idea to start with a 16-bit, 44.1kHz file rather than reduce resolution. When I wrote the article, Apple was using 22.05kHz mono files to showcase the QDesign Music Codec—it was in the very early days of QuickTime 3 and neither I nor, apparently, Apple knew yet that you should use 44.1kHz files for best effect. These were the files that I used as the basis for my examples. I think we both know better now. —Christopher Breen m

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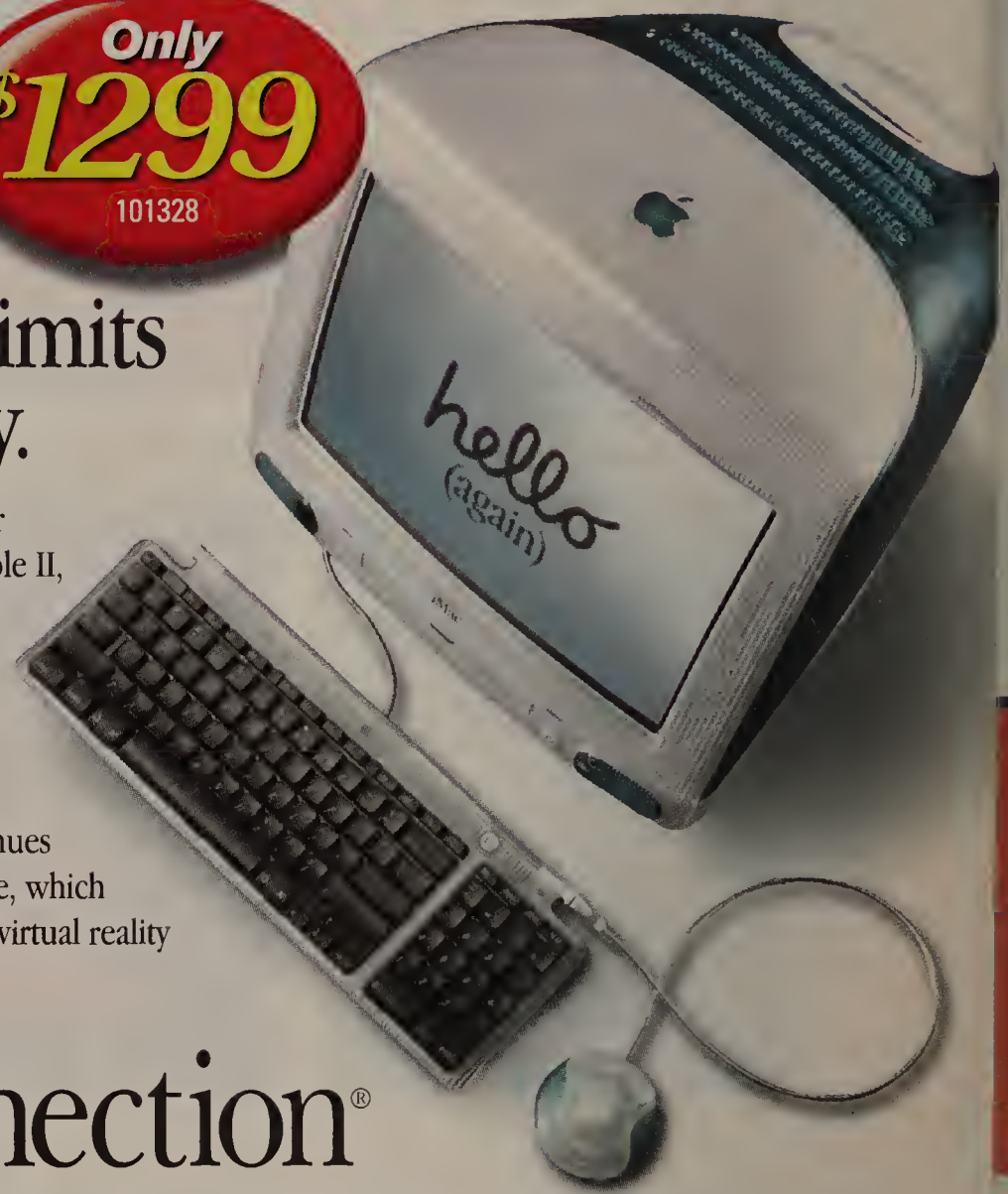

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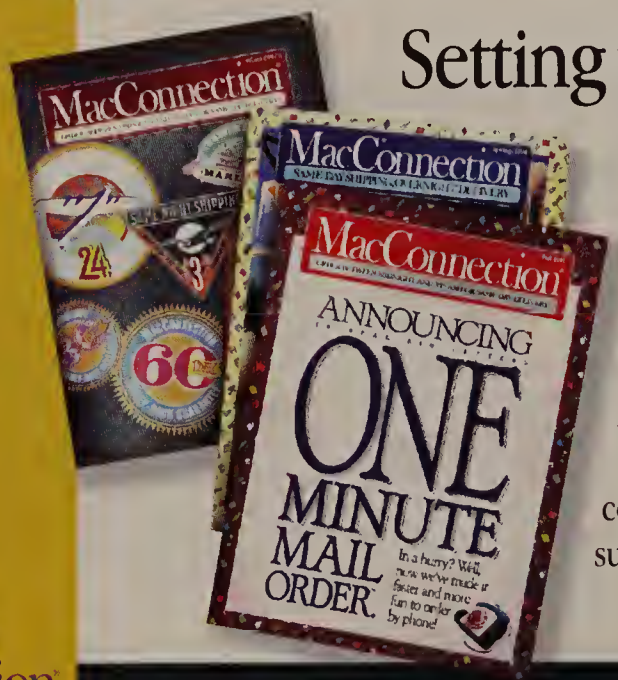

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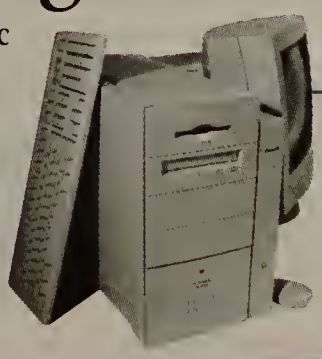

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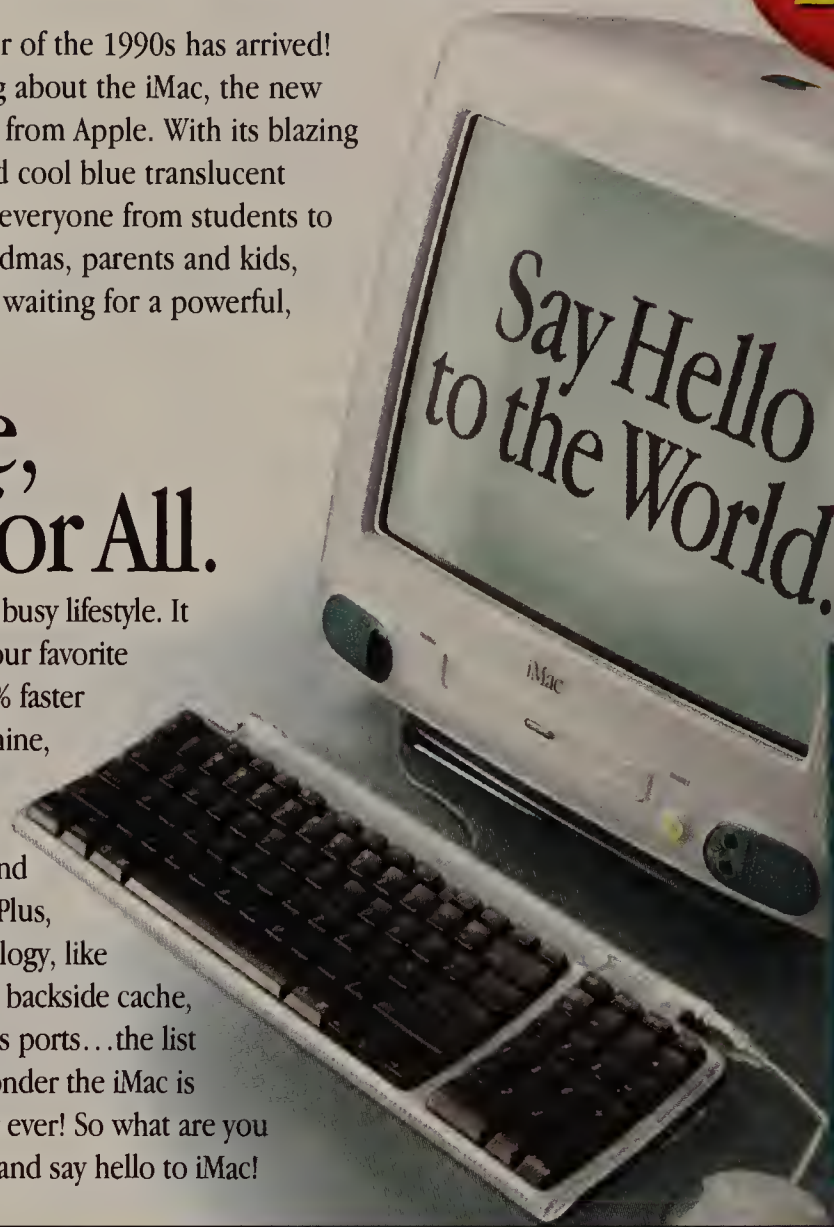

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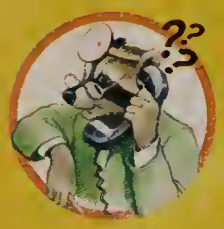

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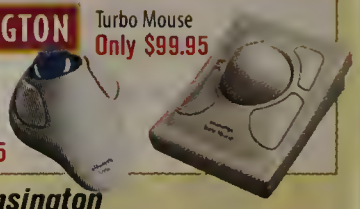

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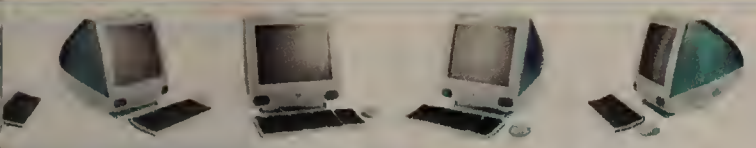

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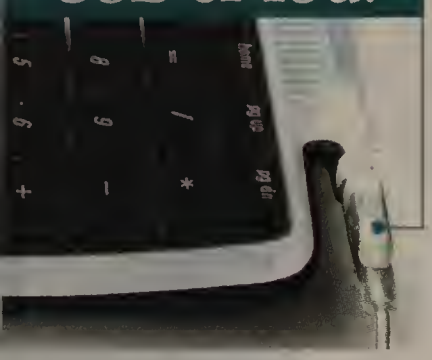

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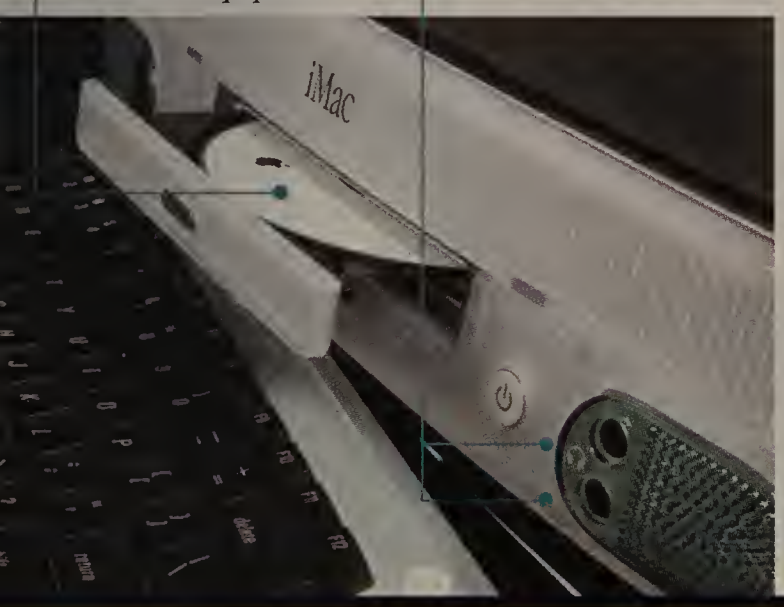
The iMac delivers premium sound through its built-in SRS stereo speakers. Music lovers also have the option of attaching external speakers. Two headphone jacks makes gaming a blast for players (but quiet for you).



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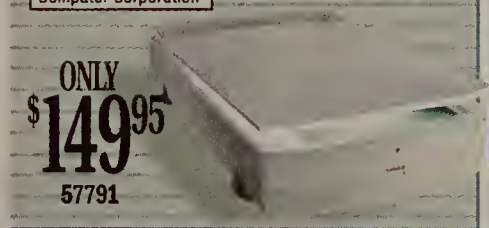

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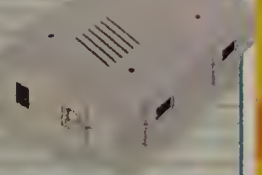

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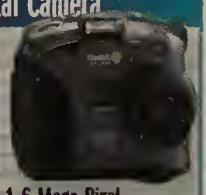

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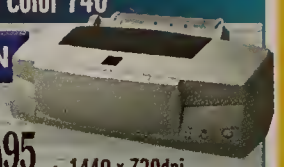

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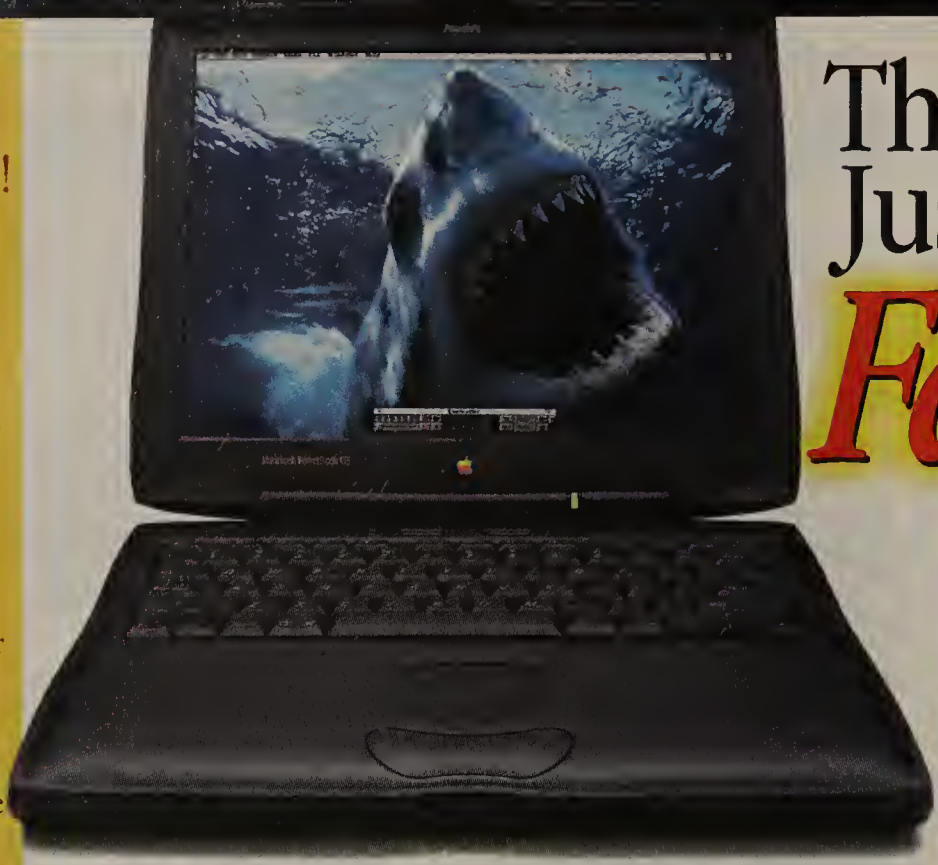

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56126	G3 233MHz	–	12.1" DSTN	32/192MB	2MB	2GB	56K	20X	7.2 lb	–	●	2199
102203	G3 233MHz	512K	14.1" TFT XGA	32/192MB	4MB	2GB	56K	20X	7.6 lb	●	●	2799*
102205	G3 266MHz	1MB	14.1" TFT XGA	64/192MB	4MB	4GB	56K	20X	7.6 lb	●	●	3499*
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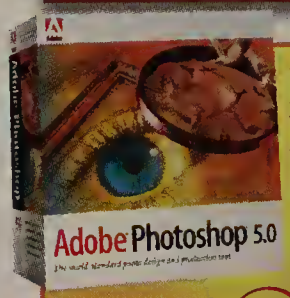

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	Apple Power Mac 6100	
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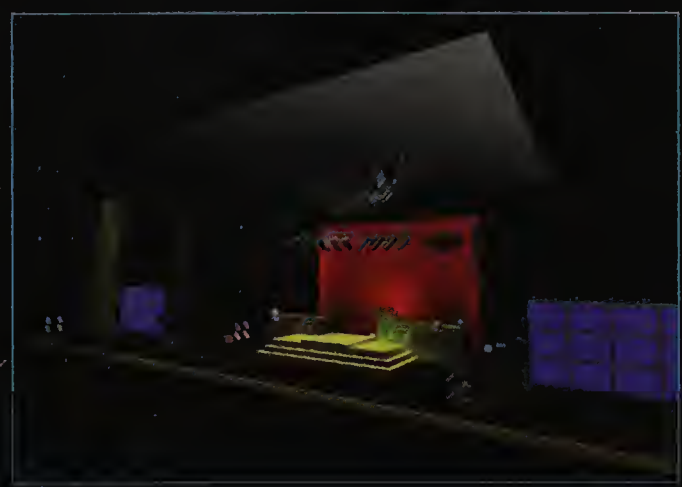

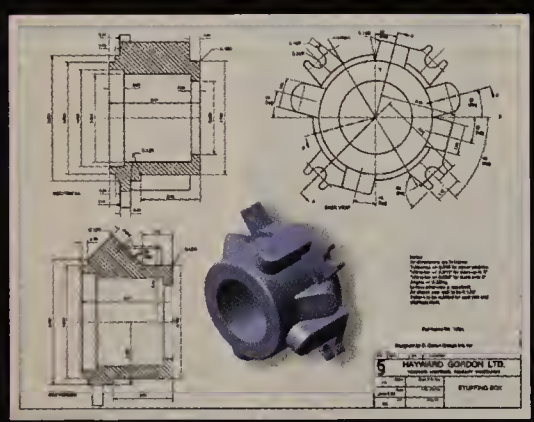

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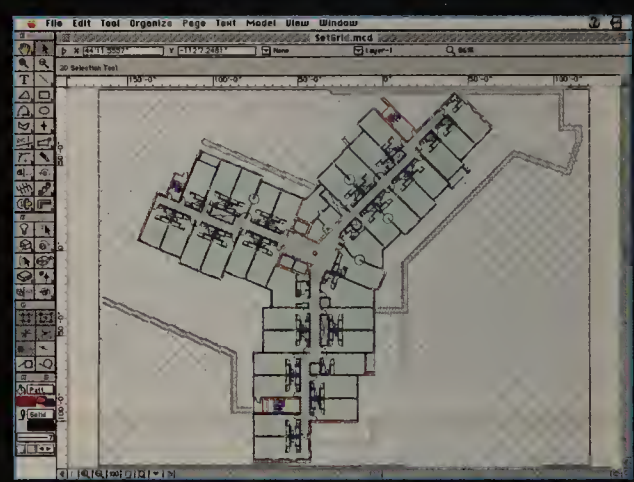

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The Vision Thing

by Andrew Gore

Passing the Test

IF YOUR MAC CAN MAKE IT WITH MACBENCH 5.0, IT CAN MAKE IT ANYWHERE

IF MISSOURI IS THE SHOW Me State, then New York must be the Prove It City. As a born-and-bred New Yorker, I've got to see proof before I buy into a company's claims about its products—even after more than a decade of living in laid-back California. But it can be tough to make a computer prove itself—it's hard to tell if one Mac is faster than another simply at a glance. Even if you *think* you notice a difference, you can't tell if the faster Mac is fundamentally faster or if it's just tricked out with a fast hard drive and a large disk cache.

I was reminded of this problem on a recent trip back to the Big Apple for the debut of MacBench 5.0, the latest version of the Ziff-Davis Benchmark Operation's Macintosh performance-testing tool. At the debut, I was amazed at how many rank-and-file Mac users were seriously interested in MacBench. Moreover, I was impressed by how many really understood that MacBench is more than just a means of finding out how fast a Mac is. It's also a great tool to help fine-tune the performance of your current system.

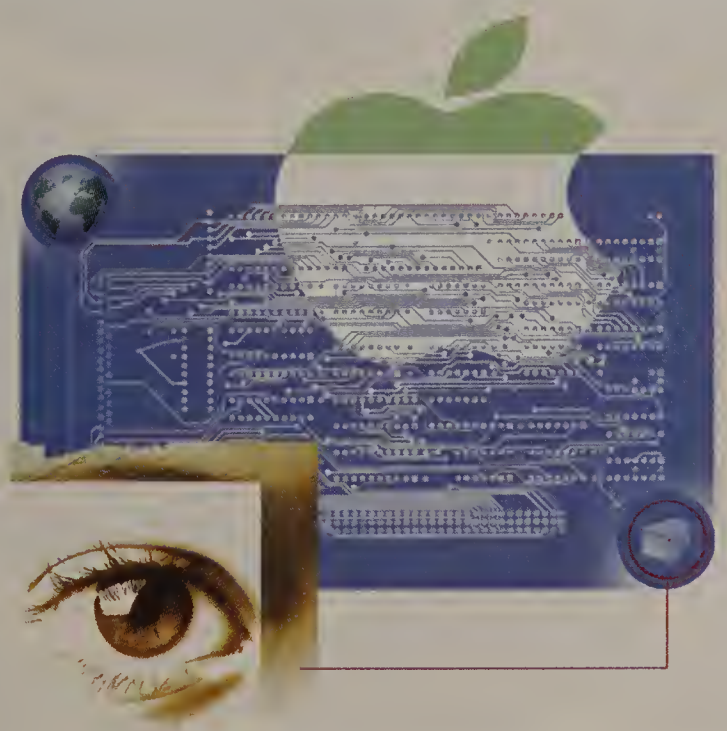
Fifth Generation

With the feature story "Gigs to Go" in this issue, *Macworld* makes the move from MacBench 4.0 to MacBench 5.0 for testing the speed of Macintosh subsystems. (We will continue to use SpeedMark to determine the overall, real-world performance of new Macs.)

MacBench is an application that uses profiles of how real-world applications work with the operating system (and therefore with the computer itself), replaying the actions of those "real" applications without actually needing the programs themselves to be present. By timing how long a Mac takes to execute these actions, MacBench determines the speed of a Mac's processor, storage, and graphics subsystems.

For example, when MacBench 5.0 tests your Mac's publishing-related graphics capabilities, it plays back the QuickDraw calls made by Adobe Photoshop and QuarkXPress, two of the Mac's most popular publishing applications. These calls simulate what those applications would actually do when running a set of specific tasks. This allows MacBench to get an accurate, reproducible score for graphics speed, without needing the actual base applications.

There are several advantages to this, not the least of which is that MacBench takes up considerably less storage and RAM space than all those apps would. Also, it allows us to make MacBench 5.0 publicly available so that you can run your own tests (and compare them with ours), all without your having to pay for a copy of Photoshop, XPress, and all the other programs MacBench uses as the basis for its tests.



JOHN RITTER

MacBench 5.0 isn't just a minor upgrade. It's a from-the-ground-up rewrite that adds much more accurate disk, graphics, and CD-ROM tests. Version 5.0 also offers easier access to powerful but often overlooked features of MacBench, such as its system profiler.

Best of all, we maintained one of MacBench's key benefits: we continue to offer it as a free download (without the graphics and CD-ROM tests) and, for a nominal fee, on CD-ROM (including the required files for those extra tests). For more info on MacBench 5.0, go to www.macbench.com.

The Mac Tune-Up

As I said, MacBench is more than just a tool to speed-test different Macs. It can also work as a tuning fork for a Power Mac.

You can use MacBench's disk tests, in combination with a disk-formatting utility like FWB's Hard Disk ToolKit, to measure hard-drive speed with various drivers and settings. By going back and forth between testing and tweaking, you can sometimes increase your Mac's disk speed considerably. And as any engineer can tell you, the disk is one of the major performance bottlenecks on a computer.

Even without a utility like Hard Disk ToolKit, you can still go to the Memory control panel and adjust your disk cache size to find the perfect balance between the amount of RAM you use for the disk cache and what you leave available for your applications. You can even use MacBench's graphics tests to see if that new high-speed graphics-accelerator board really is giving your Mac the boost you were hoping for. (Just make sure the board came with a money-back guarantee.)

For a suspicious Knickerbocker like myself, seeing those final MacBench results is almost as good as arguing with a New York merchant about the exorbitant prices. Except, you know, without all that yelling. **m**

Are you talkin' to me? Are you talkin' to me? Well, then send along your comments to visionthing@macworld.com.

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News

publishing

Adobe Previews Challenger to QuarkXPress

SEYBOLD ATTENDEES GET PEEK AT RUMORED K2 PAGE-LAYOUT PROGRAM

by Stephen Beale

BRYAN WIGGINS

Steve Jobs gave the keynote address, but Adobe Systems delivered the biggest news at the Seybold San Francisco publishing conference by offering a sneak preview of K2, the long-rumored successor to PageMaker. During Jobs's keynote session, Adobe product manager Ben Rotholtz stepped to the stage to show several features in the forthcoming page-layout program, which will compete with QuarkXPress in the professional publishing market. Adobe plans to release the software in 1999.

Illustration Features Like QuarkXPress 4.x, K2 (the code name for the product) appears to incorporate many features associated with illustration software. Rotholtz first drew a box and then reshaped it by dragging on Bézier control points. He imported a photo into the box and then placed both behind a headline that served as a mask. Even with the mask in place, Rotholtz was able to rotate the photo and box.

Rotholtz also demonstrated K2's sophisticated transformation functions, including the ability to rotate editable page elements in a 3-D space. In addition, the program will include a Navigator panel similar to those in Adobe Photoshop and Illustrator—you can zoom in up to 4,000 percent and use the panel to quickly jump around the page. The program's file structure will be based on the Portable Document Format.

Adobe offered little other information about K2. However, industry rumors indicate that the software will be highly customizable and will likely offer hyphenation and justification features superior to those in the current version of QuarkXPress.

Coincidence? Many Seybold attendees saw the K2 demonstration as a not-too-subtle dig at Quark, which before the show revealed that it had made an offer to acquire Adobe. Adobe promptly rejected the offer, but Quark replied that it might attempt a hostile takeover.

Quark is privately held and thus does not have to

continues

reveal its finances, but most industry analysts estimate that it has annual sales of $200 million, making it about one-fifth the size of the publicly traded Adobe. However, Adobe's stock price has taken a beating in recent months, making the company more attractive as a takeover candidate.

The exchange between the two graphics-software giants was a major topic at the show, causing the Seybold organizers to sponsor an emergency conference session titled "Quark and Adobe: Can We Talk?"

Apple News Aside from the K2 preview, Jobs's keynote was mostly a rehash of his presentation at July's Macworld Expo in New York. However, he said that Apple will no longer make PowerBooks with 13-inch LCDs, instead focusing on 14-inch screens. The newest PowerBook, with a 14-inch screen and a 233MHz G3 processor, will sell for $2,799.

Jobs also announced WebObjects 4.0, a new version of Apple's Web publishing software for large enterprises. Apple says the upgrade is five times faster than the previous version and will run under Mac OS X in addition to Windows NT and Unix. It will sell for $1,499.

Adobe on the Web K2 was not the only Seybold news from Adobe. The company also used the show to introduce Illustrator 8.0 and PageMill 3.0 for the Mac.

New features in Illustrator include a Gradient Mesh tool for creating complex color gradients, an Actions palette similar to the one in Photoshop, and a Links palette for keeping track of placed images. However, the upgrade does not support transparency, one of the most popular features in archrival Macromedia FreeHand 8. Adobe says it will include transparency capabilities in Illustrator 9.0. Version 8.0 will sell for $375.

PageMill 3.0, which will sell for $99, includes integrated site management, more-flexible layout features than the previous version, a built-in 216-color Web-safe palette, and an option that prevents PageMill from modifying the underlying HTML code.

Before the show, Adobe offered private demonstrations of another new Web-graphics product, ImageStyler. Much as Adobe ImageReady uses Photoshop-like tools to create Web graphics, ImageStyler features tools similar to those in Illustrator. It uses object styles to allow quick changes to buttons and other graphic elements and also makes it easy to create Java rollover effects. Aimed primarily at business users, the software will sell for $129.

Wacom Enters a New Generation

WACOM, THE FIRST VENDOR TO OFFER A PRESSURE-sensitive stylus, has revamped its product line with a new series of enhanced tablets and pens, dubbed the Intuos system (360/896-9833, www.wacom.com).

Tool ID The new Intuos pen features a more sensitive tip and 1,024 pressure levels, compared with 256 in previous versions. A new Tool ID feature lets you assign different settings, such as colors or painting widths, to each pen. When you use the pen, the software automatically adjusts to the assigned settings. Wacom expects that artists will buy multiple pens—at $49.99 each—and set them up as traditional painting instruments. One pen is bundled with each Intuos graphics tablet.

The Tool ID feature is currently supported in MetaCreations' Painter Classic, which is bundled with each Intuos tablet. Adobe Systems, Macromedia, and other graphics-software vendors have announced that future versions of their software will support the new Intuos features.

More Input The system also includes three new input devices: the $69.99 Intuos Lens Cursor, which features a rotating crosshair lens; the $99.99 Intuos Airbrush, which includes a finger wheel for controlling ink flow; and the $69.99 4D Mouse, which features a thumbwheel control for zooming in on images or navigating 3-D spaces. The 4D Mouse will also let you rotate on-screen objects once popular graphics programs have been upgraded to support the feature.

Intuos graphics tablets are available in five sizes: 4 by 5 inches ($199.99), 6 by 8 ($383.99), 9 by 12 ($509.99), 12 by 12 ($509.99), and 12 by 18 inches ($819.99). The 9-by-12-inch and 12-by-18-inch models include a 4D Mouse in addition to a standard pen. All but the 4-by-5-inch tablet support Wacom's new DualTrack feature, which lets you use two input devices simultaneously in supported software.

The pens and tablets are not compatible with earlier Wacom products.—MACWORLD STAFF

graphics

Plug-ins Abound at Seybold Show

VENDORS INTRODUCE NEW GRAPHICS ADD-ONS

by Macworld Staff

Several companies used the recent Seybold San Francisco conference to introduce new Adobe Photoshop plug-ins. These include a new version of PhotoTools, from Extensis (503/274-2020, www.extensis.com), and new special-effects filters from Alien Skin Software (919/832-4124, www.alienskin.com).

Extensis Trio Extensis unveiled upgrades to three Photoshop plug-ins: PhotoTools 3.0, Mask Pro 2.0, and Intellihance Pro 4.0. PhotoTools 3.0, priced at $149.95, features a new texture generator; a custom bevel-shape editor; and PhotoAnimator, for creating animations from Photoshop layers. Mask Pro 2.0, priced at $299.95, provides new IntelliBrush and IntelliWand tools for removing image backgrounds, a Magic Pen for creating precise edges, and an Edge-

GIBSON

Blender feature for softening edges. Intellihance Pro 4.0, priced at $199.95, lets you view the effects of up to 25 image enhancements. It also provides a test-strip output.

Alien Effects Xenofex, a $129 package from Alien Skin Software, features 16 special-effects filters for Photoshop. These include Distress, for creating organic crumbling and aging effects; Flag, for 3-D rendering of rippled surfaces; and Lightning, Electrify, Constellation, Stain, and Cloud, for creating nature effects.

Andromeda Filters Andromeda Software (805/379-4109, www.andromeda.com) introduced a new version of its Three-D Photoshop filter. The $159 software lets you map Photoshop images to 3-D objects; the upgrade lets you add engraved surfaces to the objects. Andromeda's new Vari-Focus 1.1 filter, bundled with the $119 Shadow Filter 1.12, offers a variety of options for defocusing portions of an image.

Jazzed Up BitJazz (415/642-4829, www.bitjazz.com) announced a $149 suite of lossless image-compression tools that consists of two Photoshop plug-ins, a QuarkXTension, and a trio of stand-alone utilities. The company claims that its BitJazz format provides an average compression ratio of 2.5:1 without degrading image quality. PhotoJazz is a plug-in that lets you read and write compressed BitJazz files; ImageJazz is a stand-alone compression-decompression program. The other modules, which let you decompress BitJazz files, are freely distributable.

Knockouts Ultimatte (818/993-8007, www.ultimatte.com) introduced Ultimatte Knockout, a masking tool for use with photos that include hair, blurred edges, glass, smoke, and other transparent or translucent elements. For example, you can use the program to retain smoke in the foreground of an image while eliminating the background.

It's a stand-alone program but saves images with an alpha channel for use in Photoshop. It sells for $395 until January 1, 1999, after which the price becomes $495.

multimedia

QTVR Tools in the Pipeline

NEW PROGRAMS OFFER PANORAMA BUILDING, SPECIALIZED FUNCTIONS

by Michael Gowan

A new generation of QuickTime VR (QTVR) authoring tools is here. QTVR, which turns flat pictures into interactive virtual environments, has gained popularity as authoring tools become easier to use.

To construct a QTVR panorama, you first take a series of photos from a central pivot point, turning the camera 360 degrees. You then use the QTVR program's stitching functions to combine the pictures into a long, flat panorama. When you create the QTVR movie, the panorama is wrapped into a virtual cylinder, creating the illusion that the viewer is standing in the middle of the scene. Some QTVR programs can also create object movies, which let viewers see an object from multiple sides.

BRYAN WIGGINS

The Basics For simple QTVR movies, Enroute's $69.95 QuickStitch 360 (650/843-1122, www.enroute.com) provides basic stitching and QTVR authoring functions. The program builds on Enroute's QuickStitch, a $39.95 program that offers stitching features without QTVR authoring.

Live Picture (408/371-4455, www.livepicture.com) plans an upgrade to PhotoVista, a $49 package that creates panoramas in QTVR format or the company's own IVR format. The upgrade will support the latest megapixel digital cameras and will also let you use FlashPix images inside IVR panoramas. FlashPix is an emerging file format for Web graphics that incorporates multiple-resolution versions of an image.

However, Live Picture has reversed its earlier decision to release a Mac version of Reality Studio, an all-in-one VR authoring package already available for Windows.

More Competition In addition to IVR, another QTVR alternative is Ipix, a VR format developed by Interactive Pictures (423/482-3000, www.ipix.com). To create an Ipix movie, you take two pictures with a fish-eye lens and then use the company's Ipix MacWizard software to stitch them together into a spherical panorama. Because the image is mapped inside a sphere, viewers can pan up and down as well as around.

continues

Product WATCH

Lasers Stake Graphics Claims Targeting graphic designers, QMS (334/633-4300, www.qms.com) has introduced the **Magicolor 330**, a tabloid-format color laser printer with built-in color-calibration and color-management tools. The $4,499 base model offers 600-dpi resolution; an enhanced, $5,499 version lets you print at 1,200 dpi up to 13 by 19 inches. The $3,999 **SuperScript 4400N**, from NEC (800/632-4636, www.nec.com), prints letter-size pages at 1,200 dpi. It features a built-in Ethernet interface and supports Adobe's WebReady technology, which is part of PostScript 3. WebReady lets you access printer features from standard Web browsers.

New Homes for Old Products Logitech (800/231-7717, www.logitech.com), which announced on August 10 that it had bought Connectix's hardware division, wasted no time in unveiling its first new product, a Universal Serial Bus version of the QuickCam digital-video camera. It sells for $99 after a $30 rebate. **Now Utilities** for the Mac has also found a new home. Qualcomm announced in August that it had sold the Mac system-utility package to Power On Software (612/317-0344, www.poweronsw.com).

SOHO Scanner Epson America (800/463-7766, www.epson.com) thinks SOHO users are ready for heavy-duty scanning. The $299 **Epson Perfection 636** flatbed scanner features 600-dpi resolution and 36-bit color depth. A 4-by-5-inch transparency adapter costs $99.

The Ipix MacWizard costs $349.95, but you must also purchase an additional $25 software key for each panorama you create. Interactive Pictures offers a $2,000 bundle that includes the software, 36 keys, a Kodak or Olympus digital camera, and a fish-eye lens. The company also plans to release a Nikon digital-camera bundle.

Unexploited Functions A few of the new programs take advantage of unexploited capabilities in QTVR. Vrtools' ConVRter shareware (www.vrtools.com) increases your control over QTVR panoramas. You can change various movie parameters and convert between QTVR 1.0 and 2.0 file formats, as well as add custom cursors and fast-start capability. Vrtools' PanoMagic, also shareware, turns stitched panoramas into multinode QTVR movies.

Squamish Media Group's $495 VRchitect (www.smgvr.com) converts 3DMF files created by CAD or 3-D-graphics software into VR panoramas. The panoramas can include wired sprites—objects with associated actions. For example, the rendered movie can include an indicator that shows your current heading within the panorama.

Legal wranglings are clouding prospects for some other QTVR authoring tools. Roundabout Logic (407/327-4500, www.roundaboutlogic.com), whose Nodester was one of the first QTVR authoring tools, has announced plans to release an upgraded version as part of a software suite. However, the company is engaged in a legal dispute with VR Toolbox (412/767-4408, www.vrtoolbox.com), which claims to have exclusive rights to the same underlying software (see the sidebar, "QTVR Vendors in Legal Battle").

printing

Drought Ends for Macintosh Ink-Jets

EPSON AND HP UNVEIL NEW PRINTER MODELS

by Macworld Staff

Dry times may soon be over for ink-jet printers in the Macintosh market. Until recently, Epson America (800/463-7766, www.epson.com) was the only company actively selling ink-jet printers for the Mac. However, Hewlett-Packard (HP; 800/752-0900, www.hp.com) has announced the first Mac ink-jet printer under its new relationship with Apple, and Epson has bolstered its product line with a model that essentially replaces the Stylus Color 600 and 800.

HP's Reentry In April, Apple announced that it would assist HP in bringing the latter's ink-jet printers to the Mac market; previously, HP supplied printers that Apple sold under its own label.

HP's new DeskJet 697C is an entry-level ink-jet printer designed for use with Apple's iMac. The base version sells for $179, but you also need HP's $69 Universal Serial Bus (USB) connection kit, for a total cost of $248. The DeskJet 697C ships with one black and one three-color cartridge, but you can also purchase a $39.95 photo cartridge that turns the printer into a six-color device. The printer will not work with other Mac models.

New from Epson Epson's latest is the $279 Stylus Color 740, which features built-in USB and serial ports for connection with any Mac model.

HP's DeskJet 697C features a USB interface.

The four-color, 1,440-by-720-dpi printer uses the same Micro Piezo technology as Epson's other ink-jet models but varies the dot size to improve image quality.

QTVR Vendors in Legal Battle

A LEGAL DISPUTE BETWEEN TWO SOFTWARE publishers is clouding the future of Nodester and Widgetizer, which were among the first programs for creating QuickTime VR (QTVR) content. Roundabout Logic and VR Toolbox are both offering essentially the same QTVR authoring packages and have each filed a lawsuit seeking to prevent the other from shipping its software.

Wheeling and Dealing Nodester and Widgetizer were originally developed by Econ Technologies, a small Florida programming shop, and published by Panimation, which later became Roundabout Logic.

Roundabout Logic alleges that Howdy Emery, president of Emery Manufacturing and Equipment of Pittsburgh approached the company in May with a potential buyout offer but then backed out and cut a separate deal with Econ Technologies to acquire the rights to Nodester and Widgetizer. Emery then set up a new company, VR Toolbox, to offer the programs as VR PanoWorx and VR ObjectWorx, respectively.

Roundabout Logic alleges that it had exclusive rights to Nodester and Widgetizer; Econ Technologies and VR Toolbox claim that Roundabout had no such rights and that Econ was legally entitled to sell the software to VR Toolbox. As of August, Econ was working on upgrades to VR PanoWorx (Nodester) and VR ObjectWorx (Widgetizer) as well as a new program called VR SceneWorx for creating multinode QTVR movies, which can include multiple QTVR panoramas and object movies. Roundabout Logic had planned to offer the third package as part of a suite with Nodester and Widgetizer.

Daunting Task Econ is no longer doing software development for Roundabout Logic. Bob Shaw, president of Roundabout Logic, says he has hired software engineers to continue development work—which could be a daunting task if they don't have the cooperation of the original programmer.

In June, both companies requested preliminary injunctions in the U.S. District Court for central Florida, asking that the other be prevented from shipping its products. Both requests were denied. A tentative court date for the main dispute has been set for February 1999.—STEPHEN BEALE

KEVIN CANDLAND

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Reviews

iMac

GROUNDBREAKING CONSUMER OFFERING LIVES UP TO ITS HYPE

KEVIN CANDLAND

AFTER MONTHS OF CAREFULLY crafted publicity and almost unprecedented media attention, Apple's eagerly anticipated iMac has arrived. Although *Macworld* editors have had several opportunities to play with iMac prototypes since May, the recent arrival of the blue-and-white pod marks the first opportunity Macworld Lab analysts have had to test an iMac. What we found will give Apple—and Mac boosters everywhere—reason to celebrate.

Out of the Box

In terms of setup, Apple has done a fantastic job. The spartan installation guide's six photographs walk you through unpacking the machine; plugging it in; and connecting the keyboard, mouse, and modem.

Immediately, you notice the crispness of its built-in color monitor. Although the iMac lacks the Sony Trinitron technology that graces Apple's best monitors, the iMac's display benefits from incredibly high refresh rates—117Hz at 640 by 480 pixels, 95Hz at 800 by 600, and 72Hz at 1,024 by 768 pixels.

Although it produces a sharp image, the unit's 15-inch screen proves a bit small for daily use. While the display supports resolutions as high as 1,024 by 768 pixels, it's far easier on the eyes to view at the standard 800-by-600 setting. And at this lower resolution, you can get 24-bit color without expanding the video SGRAM from the included 2MB to its maximum 4MB.

Despite a few odd-size keys, the iMac's translucent keyboard offers good key response and a solid feel. Alas, the same can't be said of the iMac's mouse, where style has won out over substance. Its small form factor makes it difficult to hold comfortably, and because the mouse lacks the oblong shape of a standard mouse, it easily gets turned around.

Becoming an iMac Insider

Getting inside an iMac is deceptively simple: place the unit screen-side down, remove one Phillips-head screw, and pull off the back panel. But that's the easy part; you then have to remove three more screws and disconnect a couple of cables before you can slide out the logic board. This process is hardly brain surgery, but the iMac's design *is* more complicated than that of some of Apple's earlier Performa and education-oriented systems.

However, once inside, you can easily locate the two user-serviceable slots: the upper RAM slot on the CPU daughtercard and the video SGRAM slot. A second RAM slot resides under the CPU daughtercard, and luckily Apple installs the built-in 32MB RAM card in the lower slot, leaving the top slot open.

Best and Final Specs

Contradicting Apple's prelaunch announcements, the iMac sports a 56-Kbps modem

REAL PRODUCTS REAL RATINGS Reviews you can trust: Macworld rates only final shipping products, not prototypes. What we review is what you can actually buy.
OUTSTANDING: ♦♦♦♦♦ VERY GOOD: ♦♦♦♦ GOOD: ♦♦♦ FLAWED: ♦♦ UNACCEPTABLE: ♦

card, not a software modem. And the iMac's "phantom port" is not a user-accessible connector. According to Apple, this proprietary mezzanine slot is intended for the company's own engineering requirements; Apple has no plans to release the slot's specifications to third parties.

Both the CD-ROM drive and hard-disk drive are easily accessible (and easily replaceable), as they slide out with the rest of the logic-board chassis. Also, the iMac's CD-ROM drive is identical to a PowerBook's removable CD-ROM module, which explains why the iMac lacks a powered CD drawer and why the drive is exceptionally loud when operating. It also begs a question: As long as Apple decided to use the PowerBook's swappable CD-ROM module, why not make it swappable (for, perhaps, an Iomega Zip drive or a floppy drive) in the iMac as well?

Speaking of Storage . . .

Try as we might, we couldn't find a good reason to be upset about the iMac's lack of a floppy drive. For those users who really need a floppy drive, any of several Universal Serial Bus (USB)–based options slated for fall release should work fine.

However, while we can't quibble about the missing floppy, the same can't be said of the system's lack of a user-accessible PCI slot and high-speed peripherals bus. In almost every respect, an iMac is a Mac—it runs Mac software, it uses the Mac OS, and it offers the same high-quality user experience. But unlike with other Macs, you can't make the same assumptions about the iMac's future expandability—precisely because the iMac lacks a high-speed port or slot. Although some clever developer could find a way around this limitation, it would have been reassuring had Apple offered a solution for adding, say, an MPEG card for DVD or a 3Dfx card for fast 3-D gaming.

Are You Experienced?

All in all, there's little to distinguish the iMac from the rest of the Macintosh lineup in terms of usability, with two critical exceptions: documentation and ports. The iMac doesn't include a manual, although Apple provides extensive electronic documentation.

As for ports, the iMac sports both 10BaseT and 100BaseT Ethernet capabilities (a first for the Mac platform) in a single port. It's also the first Mac to ship with USB ports; alas, USB is the iMac's only serial interface.

Because of a dearth of shipping iMac-compatible USB peripherals at press time, Macworld Lab has had the opportunity to test only a few devices, and most of those were prerelease hardware. What we found wasn't too surprising: most USB devices worked fine, with the exception of one USB printer. And after an extensive test and teardown process that included an up-close examination of the USB controller chip, we were able to determine that the problem was caused by the printer's driver, not by a flaw in the hardware—as other news sources had speculated. Both the printer vendor and Apple have assured *Macworld* that the problem will be resolved in short order.

The iMac's built-in stereo SRS speakers sound great, despite their not being audiophile-quality components. And it's easy to overlook the iMac's built-in 4-Mbps IrDA-compliant infrared port, but you shouldn't. It allowed simple, fast connections to a PowerBook in our informal tests, and it should also work with IrDA-compliant digital cameras, printers, and network-access points.

The Big Speed Question

Not surprisingly, given its 233MHz PowerPC G3 with a 512K backside cache, the iMac is truly speedy. In Macworld Lab tests, it proved slightly faster overall than a comparably equipped Power Mac G3/233 desktop system, even surpassing the standard system in our MacBench 5.0 Disk tests due to its peppier Quantum hard drive.

Macworld's Buying Advice

True, the iMac is the least-expandable Mac in many years, but it's also Apple's cleanest, sexiest system ever *and* the best Mac value for the price. The iMac offers a lot for $1,299—a whole lot. And so long as you understand that you won't be adding on RAID cards and high-speed external SCSI devices, you won't be disappointed with what you get. Let's admit it, the iMac may be the first computer you'll have owned since the original compact Macs that you won't want to hide under your desk.—ANDREW GORE

RATING: ♦♦♦♦ **PROS:** Amazing value; groundbreaking design; solid performance. **CONS:** No expansion options; no high-speed ports. **COMPANY:** Apple Computer (408/996-1010, www.apple.com). **LIST PRICE:** $1,299.

Macworld LAB TEST

iMac: Faster Than a Standard G3/233

Best overall performance. Longer bars and higher numbers are better. ► New system. **Bold** indicates best result in a subsystem test. SpeedMark scores are relative to that of a Power Mac 7100/80, which is assigned a score of 1.0. MacBench scores are relative to those of a Power Macintosh G3/300 with a display resolution 1,152 by 870, which is assigned a score of 1,000 for each test.

	SPEEDMARK 1.0	MACBENCH 5.0		
	Overall Performance	Processor	Disk	Graphics
► Apple iMac*	4.1	719	**706**	1,206
Apple Power Macintosh G3/233	4.0	**736**	583	**1,297**
Apple Power Macintosh 6100/60**	0.7	88	233	304

*Display set to 800 by 600 pixels. **Equipped with 32MB of RAM.

Behind Our Tests

Macworld's SpeedMark test suite covers 54 real-world tasks in 15 programs and the Finder. MacBench 5.0 (available for download at www.macbench.com) measures performance of the processor (CPU and cache), disk, and graphics subsystems in isolation from other components. Unless otherwise noted, all systems were equipped with 64MB of RAM and a 512K system disk cache and were running Mac OS 8.1. All displays were set to 24-bit color running at 832-by-624-pixel resolution unless otherwise noted.—Macworld Lab testing supervised by Kevin Mitchell

FileMaker Pro 4.0 Developer Edition

CREATE STAND-ALONE SOLUTIONS, JAVA TIE-INS, AND EXTERNAL PLUG-INS

DEVELOPERS WHO DISTRIBUTE solutions to a few hundred people on the Internet or in a technical-support department turn to FileMaker's Solutions Development Kits (SDKs) to create stand-alone versions of their database applications. The latest version of the FileMaker SDK, FileMaker Pro 4.0 Developer Edition, enables developers to create royalty-free, cross-platform run-time versions of FileMaker Pro 4.0 databases. For programmers, it also includes tools to write external functions (plug-ins) that add new capabilities to FileMaker Pro, or to create Java programs that interact with FileMaker's Web Companion.

Ties That Bind

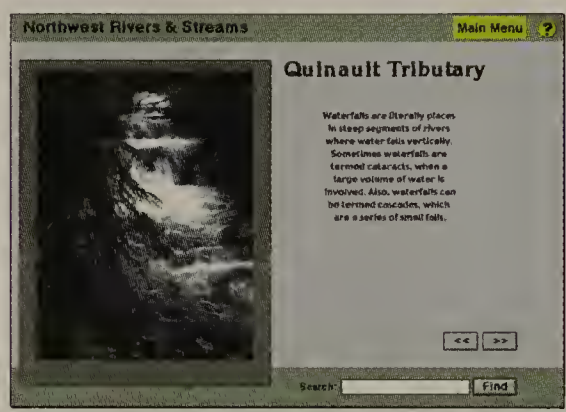
The Developer Edition's two hybrid CD-ROMs contain Mac OS and Windows versions of FileMaker Pro 4.0, Home Page 3.0, and the FileMaker Pro Binder tool for converting databases into stand-alone applications. The CDs also offer documentation, libraries, and sample code for creating FileMaker Pro plug-ins and linking Java programs to FileMaker, as well as Metrowerks' CodeWarrior Lite to help you get started with plug-in or Java development. Previous FileMaker SDKs didn't include FileMaker Pro itself; including the full version is a nice courtesy.

The FileMaker Pro Binder is so simple you'll think you must be missing something. Just select your premade databases, pick a binding key, set a few options, and then watch as the Binder creates a directory with your stand-alone program and associated support files. Mac OS applications run under System 7.1 or higher and must be bound under the Mac OS; Windows applications must be bound using Windows and can be distributed to users with Windows 3.1, 95, 98, or NT.

Binder options let developers specify custom About and Help scripts; rename the Script menu; and prevent users from accessing scripts, privileges, and field or relationship definitions. Bound applications can also be deployed in Kiosk mode, which blocks access to the menu bar and other programs.

Although FileMaker requires that stand-alone applications use a custom About layout and include a license agreement, you can distribute run-time applications, royalty-free, to as many people as you like. The stand-alone applications are solid: my testing turned up no serious functional or configuration issues with bound FileMaker applications.

Designing databases that are effective stand-alone applications is no small feat; the Binder's brief documentation touches on a few issues such as file names, fonts, graphics, and layouts, but other pitfalls (such as running applications from read-only media) will be familiar only to experienced FileMaker developers. Even though the Binder is simple, be prepared to run your solution through it repeatedly as you find and fix unanticipated problems.



Information, Please You can create stand-alone FileMaker applications using Kiosk mode, ideal for interactive presentations or guide stations that need the power of a database.

Bound applications have one tremendous shortcoming: they offer no networking capability, even though stand-alone applications created with previous FileMaker SDKs retained full network features. End users who need to access FileMaker databases hosted on a network must use FileMaker Pro itself (decidedly not royalty-free) or wait for the company to release a slim client with networking capability but no database-authoring features.

Plug-ins and Java

FileMaker Pro 4.0 can be extended via external plug-in functions; in fact, that's how FileMaker Pro's Web Companion is implemented. However, FileMaker developers expecting a cornucopia of plug-ins in the Developer Edition will be disappointed. Instead, the CDs contain documentation and sample code that enable programmers familiar with C or other languages to create FileMaker plug-ins for Macintosh and Windows. Programmers will find the API straightforward and reasonably flexible.

Plug-ins are mainly intended to provide new types of calculations—like encryption, search-and-replace operations, and data validation—but can be stretched to offer new functions such as triggering scripts, scheduling, creating custom dialog boxes, or drawing graphics.

Java developers will be happy with the Developer Edition's new, tidy Java class libraries. Using these classes, Java programs can communicate with FileMaker Pro to display, create, modify, and delete records—in fact, you could write a custom front end in Java, bypassing the Binder entirely. However, the Developer Edition's Java classes interact only with FileMaker databases published via Web Companion, which is not a high-performance, full-featured Web server. If Web Companion can't handle the load from your Java programs or isn't suitable to your needs, these Java classes won't help you.

Macworld's Buying Advice

If you need to distribute your databases to more than a handful of users without requiring them to own FileMaker Pro itself—and if the lack of networking support doesn't bother you—then the FileMaker Pro 4.0 Developer Edition is for you. Otherwise it's only of interest to serious programmers who want to create unique plug-ins to enhance FileMaker Pro or to Java developers willing to interact with FileMaker Pro via Web Companion.—GEOFF DUNCAN

RATING: ♦♦♦ **PROS:** Reliable and royalty-free cross-platform stand-alone databases; plug-in and Java capabilities offer new opportunities to programmers. **CONS:** No networking capabilities in stand-alone databases; Java classes require Web Companion. **COMPANY:** FileMaker (408/987-7227, www.filemaker.com). **LIST PRICE:** $499

ix3D Road Rocket

PC CARD ADDS DUAL-SCREEN SUPPORT TO POWERBOOK G3

APPLE GIVETH AND APPLE taketh away. Consider the PowerBook: In days gone by, if you attached an external monitor to an Apple laptop, you could choose between video mirroring, in which the external monitor mimics the image displayed by the PowerBook, and dual-screen mode, where the external monitor acts as an extension of the PowerBook's screen. Not so with the latest generation

SUZANNE ROADY

of PowerBook G3 models. Currently the only way to display two independent screens with a PowerBook G3 is to use iXMicro's ix3D Road Rocket, a graphics-accelerator PC Card that slips into the PowerBook G3 series's CardBus slot.

Rocket Mac

The Road Rocket is a bulky affair, with a large heat sink that sticks out, somewhat awkwardly, from the CardBus slot. Treat the card carefully—banging it against a hard surface while inserted could ruin both the card and your PowerBook. Beneath the heat sink is a video port where you attach either of the included video cables—one cable for Mac monitors and the other for VGA displays.

The Road Rocket package includes all the drivers you need to run the card, as well as a CD-ROM with Kai's Power Show, a limited version of MetaCreations' slide-show creator, Kai's Power Show 1.1 (see review in this issue); WebPainter SE, a light version of Totally Hip Software's Web animation tool; and a number of graphics-application demos. The Road Rocket supports Apple's ColorSync and offers hardware pan-and-zoom for easier pixel editing.

The Road Rocket is based on the same 128-bit TwinTurbo 128-3D controller found in iXMicro's ix3D Mac Rocket video card for PCI Macs and sports the same 4MB of SGRAM video RAM as the Mac Rocket. This controller offers both 2-D and 3-D acceleration and supports true color depth (millions of colors) at resolutions up to 1,152 by 870 pixels at refresh rates from 75Hz to 99Hz.

Although the Road Rocket employs the same controller as the Mac Rocket, the former's performance is not as sprightly as that of the latter because the PowerBook's CardBus slot can't transfer data as quickly as a desktop Mac's PCI bus. The Road Rocket's peak scroll rate is 400 MBps versus the Mac Rocket's scroll rate of 640 MBps. Color-fill rates and the speed at which polygons are drawn are likewise hampered.

PowerBook Performance

The Road Rocket performs better than the PowerBook's on-board video in certain situations. For example, application-based scrolling is noticeably faster with the Road Rocket than with the PowerBook's on-board video—largely due to the card's ability to cache open files. In Macworld Lab tests, the Road Rocket scrolled Microsoft Word and QuarkXPress documents approximately 25 percent faster than the PowerBook's on-board video; it scrolled Adobe Photoshop files nearly three times faster than the on-board video. Neither the Road Rocket nor the PowerBook G3/292's on-board video outpaced the on-board video of the Power Mac G3/300 desktop system we used as a high-end baseline. The desktop Mac maintained a clear edge in MacBench 5.0's scrolling tests.

Although the Road Rocket provides 3-D hardware acceleration, that's not a compelling reason to buy. The card offers unremarkable 3-D performance and won't run Quake Rave, the 3-D version of the popular MacSoft game.

Macworld's Buying Advice

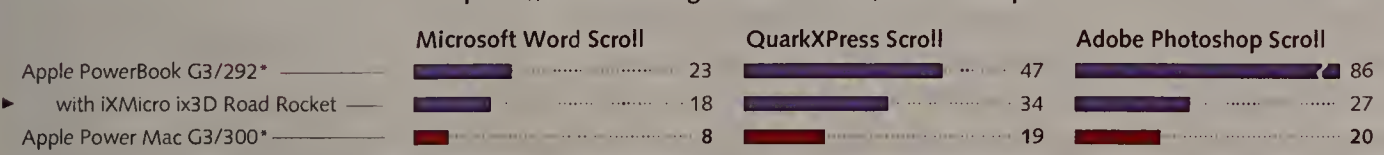
If you need dual-screen capability on your PowerBook G3–series computer, you have no choice but to purchase the ix3D Road Rocket—it's the only game in town. Thankfully, the Road Rocket comes with enhanced scrolling support, a decent software bundle, and a reasonable price tag.—CHRISTOPHER BREEN

RATING: ♦♦♦♦ **PROS:** Unique dual-screen support on a PowerBook G3; faster scrolling. **CONS:** Bulky; unimpressive 3-D capabilities. **COMPANY:** iXMicro (408/369-8282, www.ixmicro.com). **LIST PRICE:** $349.

Macworld LAB TEST

ix3D Road Rocket: Speedy Dual-Screen Support

Best result in test. Application test times are in seconds. Shorter bars are better. Higher numbers for MacBench 5.0 scores are better. MacBench 5.0 scores are relative to that of a Power Mac G3/300 (at a resolution of 1,152 by 870 pixels), which is assigned a score of 1,000. ► New product.



	MacBench 5.0 Scroll
Apple PowerBook G3/292*	1,276
► with iXMicro ix3D Road Rocket	1,232
Apple Power Mac G3/300*	1,421**

*On-board video. **Faster than standard MacBench 5.0 score due to lower resolution.

Behind Our Tests

The PowerBook G3/292 was equipped with 128MB of RAM. The baseline Power Mac G3/300 was equipped with 64MB of RAM. All systems were tested at a resolution of 1,024 by 768 pixels.—**Macworld Lab testing supervised by Kristina DeNike**

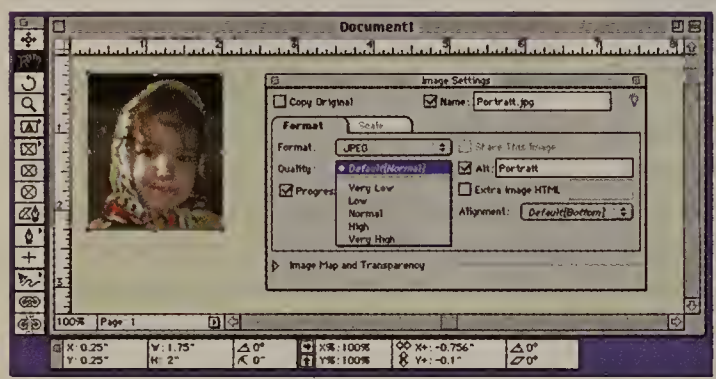
XPress-to-Web Translators

XTENSIONS EASE WEB-PAGE CREATION

QUARKXPRESS IS A PRINT-PUBlishing program at heart, but add Extensis's BeyondPress 4.0, HexMac's Challenger XT 1.0, or Gluon's WebXPress 2.0, and the venerable page-layout tool doubles as a Web publishing tool. These three XTensions (XPress plug-ins) let QuarkXPress users create Web pages in a familiar environment; still, none of these offerings are quite the WYSIWYG Web publishing tools they're cracked up to be.

BeyondPress 4.0

BeyondPress 4 lets you create Web pages from scratch, as well as convert existing documents. With BeyondPress 4, you can also export Dynamic HTML (DHTML) pages that maintain the relative positions of overlapping QuarkXPress items and also maintain text runarounds.



Attribute Override When you use BeyondPress to create Web pages from scratch, the Attributes Inspector palette lets you override the default settings for exported picture boxes and text boxes.

BeyondPress's QuarkXPress-like interface makes it easy to learn and use despite its many features. You get extensive control over the appearance of text and graphics; AppleScript compatibility; a Shared Elements palette that makes it easy to add repeatedly used components to Web pages; well-written documentation; and a free utility, PhotoAnimator, for creating animated GIFs.

But for all its strengths, BeyondPress also has some glaring weaknesses. You can't add frames or forms to Web pages, nor can you edit HTML code within QuarkXPress; it lacks site-management features; and it's pricey. If you need any of the missing features, you have to buy additional software.

Challenger XT 1.0

You can create Web pages from scratch using HexMac's Challenger XT, but it can't convert existing documents. (Another HexMac program, HexWeb, offers conversion features.) Instead, Challenger XT offers DHTML support, and it one-ups BeyondPress by animating or applying built-in actions to QuarkXPress items. For example, you can export items that can be moved by clicking and dragging within a browser window, or that can be displayed or hidden with a mouse-click. You can also make items blink on and off, shake back and forth, or even fly into position from outside the browser window.

Challenger XT's interface—a pair of icon-based palettes and a nicely organized Preferences dialog box—and features are easy to use. But Challenger XT doesn't live up to its manual's claims of total control of text features and support for justified text. Challenger lacks support for several typographic features (including runarounds, kerning, hyphenation, and drop caps), and justified text isn't correctly displayed in popular browsers.

At press time, HexMac announced Challenger XT 2.0, which will add support for exporting QuarkXPress pages to XML format, making the upgrade significantly more useful than the current release.

WebXPress 2.0

Unlike with BeyondPress and Challenger XT, you can't use Gluon's WebXPress to create Web pages from scratch. Rather, it's designed specifically for converting existing files into Web pages.

Instead of a single XTension, WebXPress includes four software components. WebX Converter lets you convert pictures into GIF, JPEG, TIFF, or PICT files. WebX IMap lets you create image maps for GIF and JPEG images. ColorHex lets you use an eyedropper to pick colors from an imported picture and add them to an HTML file. Finally, the WebXPress XTension lets you convert existing text documents into Web pages. Although it offers some nice features, such as the ability to save and reuse export settings and batch-convert folders of QuarkXPress documents, the product's piecemeal approach to Web-page production proves cumbersome.

Macworld's Buying Advice

Using QuarkXPress to create Web pages is a bit like using a screwdriver to open a can. You can do it, but it's not what the tool was designed for. The XTension approach doesn't offer the breadth of features you'll find in top-of-the-line Web publishing programs, and many of QuarkXPress's most powerful features—particularly the typographic ones—are not supported by standard HTML or DHTML and so can't be used in Web pages. Still, despite these inherent drawbacks, all three products fill gaping holes in QuarkXPress.

But if you're power hungry and aren't on a tight budget, BeyondPress should be your first choice. Its Quark-like interface and ability to both convert existing documents and create new ones helps it stand out from the others.—JOHN CRUISE

BeyondPress 4.0

RATING: ♦♦♦♦ **PROS:** Many features; QuarkXPress-like interface; good documentation. **CONS:** No support for forms and frames; weak site-management features; expensive. **COMPANY:** Extensis (503/274-2020, www.extensis.com). **LIST PRICE:** $499.95.

Challenger XT 1.0

RATING: ♦♦♦½ **PROS:** Able to animate or apply special effects to QuarkXPress items; easy-to-use, icon-based palettes and Preferences dialog. **CONS:** Can't convert existing QuarkXPress documents; no printed documentation; skimpy HTML manual. **COMPANY:** HexMac (303/940-0600, www.hexmac.com). **LIST PRICE:** $299.

WebXPress 2.0

RATING: ♦♦♦ **PROS:** Can batch-convert multiple documents. **CONS:** Multiple components make it hard to learn and use; skimpy manual. **COMPANY:** Gluon (212/343-1755, www.gluon.com). **LIST PRICE:** $189.

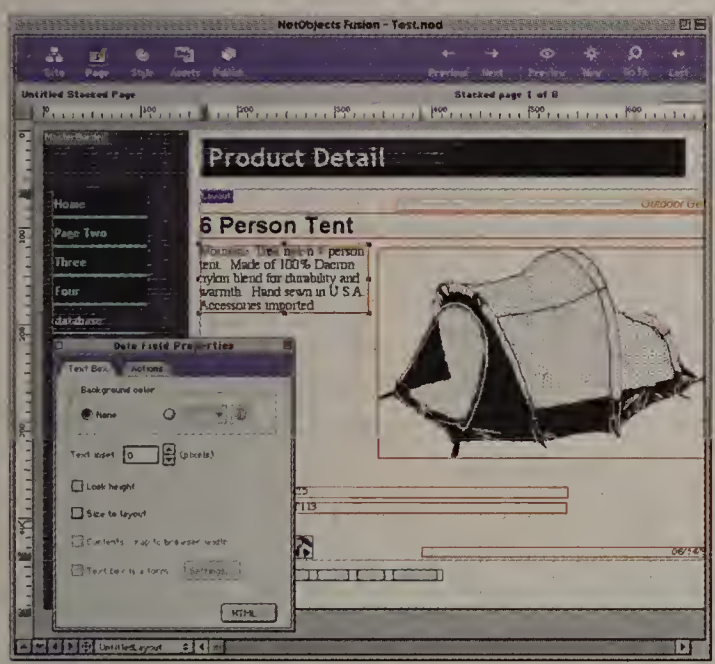
NetObjects Fusion 3.0

FLEXIBLE SITE BUILDER FINALLY SHINES

WHEN FUSION FIRST ARRIVED on the scene, NetObjects promised designers the kind of control over their Web sites that they had over print pages, but the company couldn't deliver. Although version 2.0 made great strides, it's only with version 3.0 that NetObjects has delivered a versatile Web development tool. Now sporting flexible page and site editors and strong support of Dynamic HTML features, Fusion has come of age.

Ahead of Its Time

Fusion's pasteboard has always been one of the program's killer features. With a pasteboard-layout metaphor, you create complex Web pages simply by dragging and dropping text and images on a page. Fusion generates the HTML code when you're ready to put your page on the Web.



Data Basic Fusion lets you pour the content of FileMaker records into individual HTML pages—but with limited customization.

Previous versions of Fusion use complicated grids to replicate a user's designs within the limitations of HTML. You can now also choose to use Layers, a new feature supported in version 4.0 and later browsers, to draw pages without the hidden complexity of grids. (The older, table-based system remains if you need compatibility with older browsers.) Fusion 3.0's layout editor now supports a large number of Dynamic HTML behaviors, such as animated images and rollover effects, that are on a par with those in GoLive's CyberStudio and Macromedia's Dreamweaver (see *Reviews*, September 1998).

But not all pages really call for a drag-and-drop design approach. It's much easier to treat pages with long streams of text as one large text block, rather than as several smaller layout elements. With version 3.0, Fusion's page editor allows authors to create pages (including those with in-line graphics) entirely within a word processor–style interface, similar to that of competitors CyberStudio and FileMaker's Home Page. You can also opt to use the contents of a hand-coded HTML file as the body of a page (using Fusion merely to generate navigational elements), add custom HTML tags within pages, and add externally generated HTML pages to the site structure.

The Site's the Thing

Fusion's other claim to fame has been the program's integrated site-management tools. Since the entire structure of a Web site is saved within Fusion, the program can automatically generate navigational buttons and links on every page of your site as well as frame sets for those navigational items. Once a site's ready to go online, Fusion automatically generates all the appropriate files and can optionally upload them to a Web server.

In previous versions, users had little control over how Fusion organized the HTML files. But with Fusion 3.0's Publish window, you can specify exactly where you want every file on your Web site to be placed and what you want each one to be named.

FileMaker Enters the Picture

For some time, the Windows version of Fusion has been able to automatically generate pages based on the contents of an external database; the Mac version finally catches up in version 3.0, letting you create pages from FileMaker Pro.

You can place a table on a Web page that contains selected fields from a selected FileMaker database, one row per record. Clicking on a row's link takes you to a detail page for a particular record, which lists other selected information extracted from FileMaker. This information is static—it doesn't update when you change the FileMaker database, but rather when you reexport HTML.

Although it's encouraging to see this feature finally come to the Mac, limitations hamper the feature's usefulness. For example, the record table follows a particular format that is impossible to edit, and you can't do very much to customize detail pages. Furthermore, the database-publishing feature is unstable: Fusion crashed several times when I tried to publish pages generated from FileMaker, and sometimes it took as much as a minute to generate a custom page.

Fusion's lineage as a port from Windows has always been a big problem, especially the program's non–Mac-standard interface. Although Fusion still won't win any design awards, its collection of floating palettes, window tabs, and dialog boxes has been streamlined.

Fusion lacks printed documentation; NetObjects provides a 146-page *Getting Started* guide, but I constantly had to refer to the program's full documentation—a 500-page PDF file.

Macworld's Buying Advice

With NetObjects Fusion 3.0, you can quickly create attractive Web sites without learning HTML or slaving to make sure your site's navigational elements are up-to-date. Professional Web authors and Webmasters will probably still prefer to design their sites using tools such as CyberStudio or Bare Bones Software's BBEdit, both of which create pages directly in HTML rather than exporting the result. But Fusion 3.0's improved flexibility makes the program a powerful, easy-to-use tool for creating and managing Web sites. After two years of trying, Fusion finally lives up to its advance billing.—JASON SNELL

RATING: ♦♦♦♦ **PROS:** Flexible page editor lets you design pages any way you choose; site-management tools are powerful and flexible. **CONS:** Database-publishing feature is slow, unstable, and inflexible; control over HTML still somewhat limited. **COMPANY:** NetObjects (650/482-3200, www.netobjects.com). **COMPANY'S ESTIMATED PRICE:** $295.

Internet-Access Servers

MULTIMODEM LINKING PLUS DIAL-IN SUPPORT

ON-DEMAND INTERNET ACCESS for a small company's LAN can be hard to justify for mere desktop Web surfing. But an Internet router that also lets telecommuters access their office systems and the Internet can pay for itself in ISP savings alone. Two similar products—Sonic Systems' Bandit and Ramp Networks' WebRamp M3t—provide these dual capabilities in sleek, easy-to-set-up devices. Both products let you gang as many as three external modems or ISDN terminal adapters to supply faster throughput, both support dial-in access in combination with Internet routing, and both sport easy-to-use Web configuration screens.

GIBSON

Sonic Systems' Bandit (top) and Ramp Networks' WebRamp M3t

More Alike Than Different

Within their small, modem-size enclosures, Bandit and WebRamp offer virtually identical accoutrements: a four-port Ethernet hub, three RS-232 modem ports, and a handful of status lights. WebRamp is sleek and curvy, with an artistic but confusing status-light layout; Bandit's smaller form proves more logically arranged. Both offer excellent documentation and include handy quick-start guides explaining initial setup, which consists of plugging the box into your network, powering up, and configuring the product via a Web browser. Sonic thoughtfully supplies modem cables in Bandit's package; WebRamp includes only an Ethernet patch cord.

The Web-based interfaces of both units are easy to use, but Bandit incorporates Java, which enhances the user experience and protects sensitive passwords from interception on your LAN. Both products' wizards walk you through the steps of configuring modems, connecting phone lines, and testing your setup. Dynamic Host Configuration Protocol (DHCP) support lets the routers automatically configure TCP/IP settings. Both units are platform-independent, letting you connect a mix of Macs and PCs. Although you need a separate Internet account for each modem, any number of LAN users can share those accounts, and they need not be from the same ISP.

Both products support on-demand Internet routing out of the box. In normal operation, the router dials up an ISP on the first modem when a user tries to access the Internet. Other users can share this modem connection, and when traffic warrants, the router can dial up the second or third modem to increase bandwidth. With ISDN terminal adapters, you can achieve virtually instant connectivity and up to 345-Kbps aggregate bandwidth.

Dial-in Support

WebRamp comes ready for dial-in operation, but you pay for that capability in its heftier price. For $200 less, Bandit provides equivalent Internet access, but dial-in support costs another $299. Bandit's dial-in option includes a Mac-specific client that lets remote users run either IPX or AppleTalk in addition to IP, offering connections to LAN-based file servers that WebRamp can't access. Bandit also lets you define up to 100 unique user log-ins (WebRamp's limit is 3) and supports dial-back connections for improved security. If you need them, these features offset Bandit's higher total price.

Both units support LAN-based TCP/IP servers, using port mapping to connect incoming requests to the appropriate server. WebRamp uses a similar port-mapping feature for clients, supporting Blizzard's popular network game, Diablo (see *Reviews*, August 1998), and White Pine Software's CU-SeeMe videoconferencing package (see *Reviews*, August 1997). Ramp says it will add support for additional applications in the future.

You can download software (such as Bandit's dial-in access option) into either device over the Internet, and you can remotely manage either unit using SNMP, although WebRamp supports limited Telnet access for remote administration. Enterprise-network administrators needing centralized configuration support will find WebRamp's limited remote administration cumbersome, and Bandit's complete lack of remote administration a serious inconvenience.

Both units performed equally well, although neither reached the promised 345-Kbps throughput mark, peaking at about 300 Kbps. With a single user performing single TCP/IP connection operations (such as e-mail), neither unit uses more than one upstream connection. But one or more users' browsing the Web brings up multiple connections.

Macworld's Buying Advice

WebRamp and Bandit deliver almost identical capabilities, but for pure Internet access, Bandit proves a lot cheaper and every bit as capable as WebRamp. If you need dial-in access and don't require AppleTalk or IPX support, WebRamp can save you money, but Bandit's dial-in advantages are worth the extra cost if you can take advantage of them.—MEL BECKMAN

Bandit

RATING: ♦♦♦♦½ **PROS:** Java-enabled Web-based administration; dial-in supports AppleTalk and IPX; up to 100 unique log-in IDs; bundled Mac dial-in software. **CONS:** Lacks SNMP and other remote management. **COMPANY:** Sonic Systems (408/736-1900, www.sonicsys.com). **LIST PRICE:** $399; dial-in upgrade option, $299.

WebRamp M3t

RATING: ♦♦♦♦ **PROS:** Web-based administration; special-application support; Telnet remote management. **CONS:** Dial-in access does not support AppleTalk or IPX; only three unique log-ins; lacks modem cables; no SNMP remote management. **COMPANY:** Ramp Networks (408/988-5353, www.rampnet.com). **LIST PRICE:** $599.

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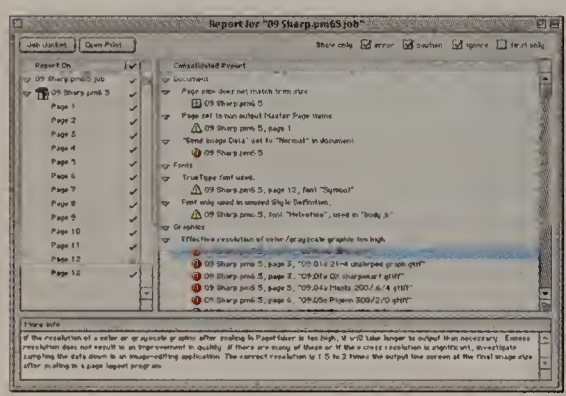
Preflight Utilities

FLIGHTCHECK, PREFLIGHT PRO SPORT PRO-LEVEL FEATURES; QUICKCHECK'S A BARGAIN

FOR SERVICE BUREAUS AND graphic-design houses, preflighting—checking documents to make sure they will be output correctly—can be a life-or-death issue, albeit one that's mainly in the details. Markzware Software's FlightCheck 3.3, Extensis's Preflight Pro 2.0, and Acquired Knowledge's QuickCheck 1.0 all facilitate the process of checking those details, helping you identify and fix any problems.

The Heavyweights

FlightCheck and Preflight Pro share a $399.95 list price, but otherwise they have different personalities. Preflight Pro has a much cleaner user interface; FlightCheck quickly clutters your screen, even on a large monitor. And Preflight is much more configurable than FlightCheck, offering a wide range of options.



Efficiency Expert Preflight Pro points out not only fatal errors such as missing fonts or graphics, but also conditions that make your job run slowly, like images with too high a resolution.

Both FlightCheck and Preflight Pro handle native application files—including files from QuarkXPress; Adobe PageMaker, Illustrator, and Photoshop; Macromedia FreeHand; and Multi-Ad Services' Multi-Ad Creator—as well as PDF files. Preflight Pro's only real drawback, in fact, is that it doesn't handle PostScript files (FlightCheck, however, handles them with aplomb).

Both products alert you to problems that will prevent your document from printing, as well as conditions that might make it print slowly, such as images that are scaled in the page-layout application, have too high a resolution, or have clipping paths with too high a flatness setting. They also alert you to quality issues, such as rules that are too thin.

FlightCheck can guide you through the process of fixing these problems. Unfortunately, many of its directions assume that you're working with QuarkXPress files. Preflight Pro also guides you through fixing potential problems, using an impressive plug-in–based autopilot feature to open the document in the original application and select the offending element. You can use different settings for QuarkXPress and PageMaker documents (because the two applications tend to create different problems) and can tackle multiple files simultaneously. Preflight Pro also lets you attach a standard job ticket with order information and a space for any special instructions. Whereas FlightCheck and QuickCheck categorize potential problems as errors and cautions, Preflight Pro sports a three-level hierarchy that lets you categorize problems as errors, as cautions, and as conditions you want to record but ignore.

FlightCheck and Preflight Pro automatically round up the elements needed to print a job—including fonts and linked graphics. (FlightCheck collects the preferences, plug-ins, and dictionaries needed for QuarkXPress files, too.) Both programs compress the whole job into a self-extracting archive or a BinHex or StuffIt file.

Preflight Pro scores well in the automation department, with strong AppleScript support and a hot-folder feature that lets you simply drag jobs into a folder for preflighting. And although most shops aren't yet set up to support PDF jobs, Preflight Pro creates PDF files for those few that do.

The Flyweight

QuickCheck 1.0 proves the most limited of the three packages, but at $99 it's also the least expensive. Unlike the other two products, QuickCheck checks only PostScript files. It's is easy to use. You simply drag and drop PostScript files onto the QuickCheck application, whereupon it analyzes the file, prepares a report, and builds a preview. The report alerts you to common problems such as missing fonts or linked graphics, or extra color plates; the preview lets you check each page visually. Although QuickCheck catches most problems that will prevent jobs from printing properly and enables you to compress PostScript files aimed at PostScript Level 2 devices for faster transmission, it doesn't try to spot things that make the job run less efficiently than it could.

Macworld's Buying Advice

Each application has its strengths. QuickCheck provides an easy and inexpensive way to make sure that you produce printable PostScript. If you typically produce PostScript files from QuarkXPress for your service bureau to download, FlightCheck will serve you well. And for preflighting native application files, Preflight Pro offers superior configurability, automation, and ease of use.—BRUCE FRASER

FlightCheck 3.3

RATING: ♦♦♦½ **PROS:** Industrial-strength error checking for both PostScript and application files; provides a wealth of information both on fatal problems and on nuisances that will slow the job. **CONS:** Cluttered, ugly user interface; strong bias toward QuarkXPress users; limited automation. **COMPANY:** Markzware Software (949/756-5100, www.markzware.com). **LIST PRICE:** $399.95.

Preflight Pro 2.0

RATING: ♦♦♦♦½ **PROS:** Beats the competition in configurability and automation features. **CONS:** No support for PostScript files. **COMPANY:** Extensis (503/274-2020, www.extensis.com). **LIST PRICE:** $399.95.

QuickCheck 1.0

RATING: ♦♦♦♦ **PROS:** Inexpensive; easy to use; catches problems that will prevent PostScript files from imaging. **CONS:** No support for native application files; does not address efficiency or quality issues. **COMPANY:** Acquired Knowledge (619/587-4668, www.acquiredknowledge.com). **LIST PRICE:** $99.

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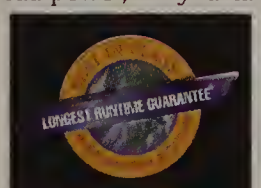

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Media Cleaner Pro 3.0

COMPRESSION TOOL DELIVERS GREAT VIDEO

TERRAN INTERACTIVE'S MEDIA Cleaner Pro demystifies the dark world of compression, the process of crunching media files for fast modem downloading or smooth CD-ROM playback. Its unmatched compression features and polished interface have made Media Cleaner Pro a must-have utility for video and audio producers.

Media Cleaner Pro 3.0 takes advantage of some of the enhancements in Apple's QuickTime 3 (indeed, QuickTime 3 Pro is included). Media Cleaner Pro can now compress and convert among numerous still-graphics formats, and it sports both minor and major compression enhancements.

Like its predecessors, Media Cleaner Pro 3.0 walks you through the compression-settings process, providing useful background and tips along the way. If you're a compression veteran, you might prefer to use the Advanced Settings window to adjust settings. You can save settings and apply them to other clips, either one clip at a time or in batch mode.

Media Cleaner Pro 3.0 supports QuickTime 3 reference movies, which enable the QuickTime browser plug-in to download the clip best suited to a user's connection speed (see "Optimizing Web Video for QuickTime 3," *Create*, August 1998). Select several compression settings and click on a button, and Media Cleaner Pro compresses multiple versions of a movie, stashes them in a folder, and creates their HTML tags.

QuickTime 3 includes a new compression scheme, Sorenson Vision's Sorenson Video, that provides remarkably high-quality video at low bandwidths. A developer version of Sorenson Video provides additional compression features and other niceties (see "Sorenson Developer Edition"). Media Cleaner Pro 3.0 is the only program that can tap into many of Sorenson Developer Edition's best features.

Media Cleaner Pro 3.0 also exploits QuickTime 3's native support for numerous still-image formats, enabling designers to use Media Cleaner Pro to compress and optimize still images, too. Media Cleaner Pro 3.0 doesn't out-optimize Equilibrium's DeBabelizer (see *Reviews*, August 1998)—it doesn't support as broad a range of file formats and saving options, for instance—but it handles the optimization tasks most designers need.

Despite all the formats it supports, Media Cleaner Pro falls flat with one form of content: QuickTime VR movies. You can't apply its talents to VR panoramas, and it displays odd error messages when you try to import a QuickTime VR movie.

Media Cleaner Pro's compression and optimization features are also improved. The program can now generate custom color palettes; in previous versions, you had to create them in a separate program and import them. There are several new video filters, including unsharp masking, and several new audio filters, including smoothing, which removes the hiss from downsampled audio.

To help you gauge the effectiveness of your settings, Media Cleaner Pro's new movie-analysis features display graphs depicting a movie's data rate, key frames, and other vital statistics. Within these graphs, you can control which portion of a clip is compressed.

Macworld's Buying Advice

Media Cleaner Pro 3.0's lack of QuickTime VR support is disappointing, but everything else about this update is a delight. From its new features to its thorough documentation, Media Cleaner Pro 3.0 is a winner.—JIM HEID

RATING: ♦♦♦♦ **PROS:** Improved interface; excellent output quality; includes QuickTime 3 Pro. **CONS:** No QuickTime VR support. **COMPANY:** Terran Interactive (408/356-7373, www.terran.com). **LIST PRICE:** $359.

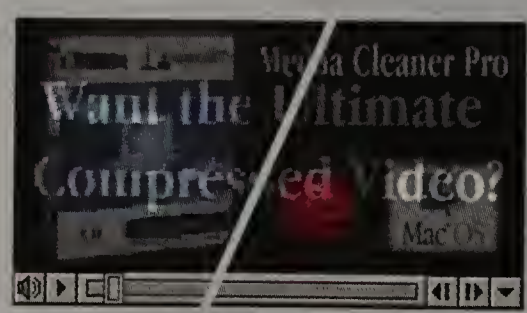
Sorenson Developer Edition

THE SORENSON COMPRESSOR/DECOMPRESSOR (CODEC) THAT ACCOMPANIES QuickTime 3 is terrific, but it provides only a subset of Sorenson Vision's compression marvels. For professional developers creating video content for the Web, CD-ROMs, or DVDs, Sorenson Vision offers the $499 Sorenson Developer Edition 1.0. This version provides several quality-enhancing compression features that the base version lacks, and the best of them are accessible only through Media Cleaner Pro 3.0.

The most significant of these features, *variable bit-rate* encoding, lets Media Cleaner Pro and Sorenson Developer Edition work together to adjust a movie's data rate (the amount of data per second) according to the movie's content. The results are dramatic: in movies containing a great deal of motion or transitions such as cross-dissolves, variable bit-rate encoding yields sharper images with far less pixelation (see "Cleaner Compression").

On the downside, Sorenson requires a speedy machine for playback. Although Cinepak-compressed movies play well on elderly 680X0 Macs, Sorenson-compressed movies demand a PowerPC or Pentium machine. And movies larger than 320 by 240 pixels demand a G3-class computer.

If you're willing to abandon users of older machines (or create Cinepak-compressed alternate movies for those folks), Sorenson is a good choice. And if you're a multimedia professional who craves quality, the combination of Sorenson Developer Edition 1.0 and Media Cleaner Pro 3.0 is hard to beat.



Cleaner Compression High-motion scenes often exhibit chunky compression artifacts, but a clip compressed with variable bit-rate encoding (right) shows far fewer artifacts than one compressed without it (left).

RATING: ♦♦♦½ **PROS:** Excellent image quality with small file sizes and low bit rates. **CONS:** Playback requires fast machine. **COMPANY:** Sorenson Vision (435/792-1200, www.s-vision.com). **LIST PRICE:** $499.

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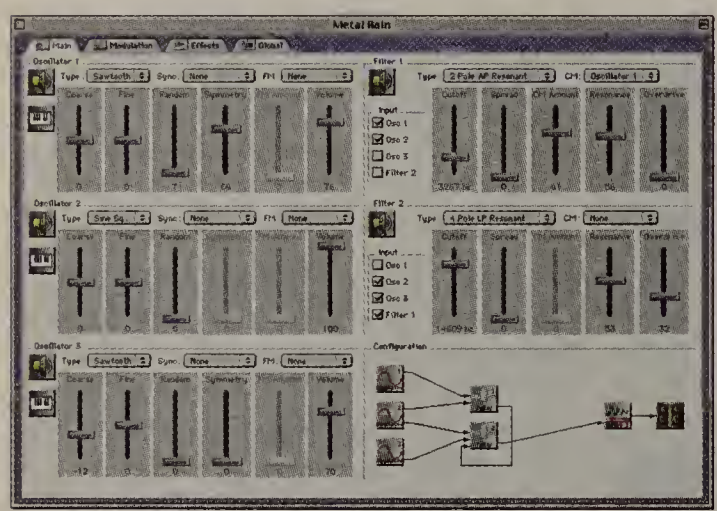
Music-Creation Tools

RETRO AS-1 OSCILLATES; GROOVEMAKER RAVES ON

THANKS TO THE ROBUSTNESS of today's high-performance processors, Macs can now tackle such complex tasks as music synthesis and seamless, real-time audio mixing—tasks that previously required dedicated and expensive hardware. Two new audio applications, BitHeadz Retro AS-1 1.1 software synthesizer and IK Multimedia's GrooveMaker 1.1, take advantage of the latest muscle-bound CPUs to make Macs more musical.

Synthesis City

Retro AS-1 is targeted at musicians and hobbyists who have an interest in software-based analog synthesis. If "analog synthesis" sounds like head-spinning jargon, just think of the keyboard tones of Herbie Hancock's *Head Hunters* recording.



Synthetic Synth The Retro AS-1 Editor's Main Page lets you generate and filter synthesizer sounds.

Much like the classic synthesizers made by Moog, Oberheim, Prophet, Arp, and Sequential Circuits, Retro AS-1 employs oscillators to generate sound. Retro AS-1's three oscillators offer the standard assortment of waveforms—sawtooth, triangle, pulse, sine, and noise.

And what would an analog synth be without filters—controls that allow you to alter the harmonic makeup of the tone produced by the oscillators? Retro AS-1 includes seven filter types that can be run in parallel or in series. Oscillators and filters can be easily switched on and off by clicking on the icon associated with each one. Retro AS-1 also includes a Modulation section, where you route modulation sources to destinations—altering a sound's volume envelope, for example. An Effects section lets you add such effects as delay, reverb, and chorus to your sounds.

Although Retro AS-1's worthy editing application lets you create sounds from scratch, you can avoid programming altogether by simply connecting your MIDI keyboard to your Mac, launching the Retro AS-1 MIDI Processor application, and playing any of the roughly one thousand sounds bundled with the program. The MIDI Processor also includes a very competent Arpeggiator—a device that plays the notes of any chord individually in sequence. BitHeadz provides special drivers for Opcode's OMS and Mark of the Unicorn's FreeMIDI, so you can access Retro AS-1 from within your favorite MIDI sequencing program.

Retro AS-1 results sound much like the real thing—Moog patches are fat, Oberheim sounds are rich, and Prophet timbres are as quirky as ever. While the source sounds are good, though, the included effects—particularly the reverb—aren't very convincing. For recording or live performance, a dedicated effects box will serve better.

If you don't have a G3 Mac, you'll also experience limited *polyphony*—the number of notes you can play simultaneously. *Latency*—the delay between striking a note and hearing a sound—is also more evident on underpowered Macs. You can reduce latency by limiting the number or quality of notes the synth produces.

It's a Groove Thang

If you're hip to the kind of unrelenting sound played in nightclubs where people dress like the Cat-in-the-Hat's urban cousin, you'll appreciate GrooveMaker. Just open one of its "songs"—hundreds of preconfigured sampled sound loops—and layer up to eight of the loops and you've got a groovy thing going. Loops include tracks featuring bass drum, snare drum, percussion, bass, melody, sound effects, and pad (chordal accompaniment). If you don't care for the loops you've chosen, you can pick others, or simply click on one of four Randomize buttons and GrooveMaker will create a groove for you. If you like what you hear, save the groove and make another.

Once you have all the grooves you desire (you can save up to 99), open the GrooveSequencer and assemble the separate grooves into an endless rave opus. If this seems like too much work, you can move to the V-Mix window, where GrooveMaker creates a nearly limitless number of random groove mixes for you. GrooveMaker's well-recorded loops include some intriguing rhythms.

Although GrooveMaker's interface is striking, it's not terribly intuitive. And because GrooveMaker was built with Macromedia Director, it responds slowly to mouse-clicks and tends to stutter if you have other applications open—as with Retro AS-1, GrooveMaker performs better with a faster processor. Also, GrooveMaker can't change a groove's tempo without also changing its pitch.

Macworld's Buying Advice

It's heartening to find music applications that take advantage of the increased power of newer Macs. Users with beefy processors who are intrigued by analog synthesis should take a long look at Retro AS-1. If you'd rather mesmerize than synthesize and are willing to live with its interface quirks, GrooveMaker will have you raving.—CHRISTOPHER BREEN

GrooveMaker 1.1

RATING: ♦♦♦½ **PROS:** No musical talent required. **CONS:** Unintuitive interface responds slowly; tempo shift changes pitch. **COMPANY:** IK Multimedia (818/707-7222, www.groovemaker.com). **LIST PRICE:** $69.

Retro AS-1 1.1

RATING: ♦♦♦♦ **PROS:** Fine-sounding analog synthesizer; lots of bundled sounds; highly programmable. **CONS:** Polyphony is limited on less powerful Macs; effects are a little weak. **COMPANY:** BitHeadz (408/465-9898, www.bitheadz.com). **LIST PRICE:** $259.

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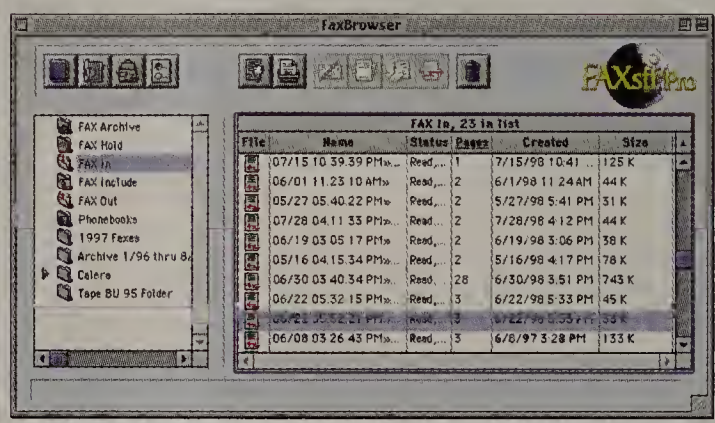
Faxstf Pro 5.0

UPGRADE OFFERS MORE THAN A FACE-LIFT

AS ONE OF THE LEADING FAX programs for the Macintosh, STF Technologies' Faxstf has garnered both kudos for its power and breadth of features and complaints about its clunky interface. Faxstf Pro 5.0 adds even more features, and a complete interface rewrite revitalizes the package.

Faxstf Pro's FaxBrowser replaces the old FaxManager and integrates features previously found in several different modules of Faxstf. The left side of the FaxBrowser window sports a scrolling area of fax-folder icons; clicking on a folder displays its contents in a list on the right. A tool bar at the top of the FaxBrowser window lets you manipulate faxes, including changing destinations, setting options such as cover-page and header information, and scheduling and sending faxes. You can drag faxes among folders and to and from the Finder.



Fax Sanity Faxstf Pro 5.0's new FaxBrowser offers a welcome change of interface, making it much easier to work with your faxes. The program's sorting algorithm, though, needs some work.

Unlike in previous versions, you can view a fax by double-clicking on its FaxBrowser icon. Displaying faxes is faster, and gray-scale images look better, too. You can enhance the readability of received faxes by adjusting the brightness, contrast, and sharpness, and an improved antialiased mode helps clarify fuzzy text. Faxstf Pro 5.0 lets you edit and mark up faxes using a tool palette with familiar tools such as Text, Line, Pencil, Rectangle, and Eraser, and you can rearrange and add pages to faxes.

Fax phone books have been beefed up with the addition of an alternate-number field; an Address tab with room for home and work addresses; and space to store e-mail, Web addresses, and notes. You can create groups to easily broadcast faxes to multiple contacts, create multiple phone books, and drag contacts and groups among phone books.

Faxstf finally includes a decent cover-page editor, with such standard amenities as grid lines, magnification, and rulers. You create templates for your cover pages and then add different objects such as text, pictures, recipient information, and date and time. The QuickNote application, which lets you fax one-page messages, uses the same templates. Thankfully, STF has removed the ludicrous 256-character limit for cover-page notes—you can include up to 32K of text.

Faxstf Pro is now AppleScript-aware; you can script automatic post-processing of received faxes, such as printing, archiving, or saving the fax with a password. STF also provides a developer's tool kit that allows third-party vendors to link to Faxstf.

One serious bug emerged during Faxstf Pro's installation. Instead of gracefully converting fax numbers from Faxstf 3.2, the installer replaced the main fax phone book, wiping out years of gathered fax numbers. Luckily, I was able to restore the old fax phone book from a backup copy.

Another annoyance is the way dates and numbers are sorted within FaxBrowser's list. Dates are handled as if they were numbers, so you get absurdities such as 10/27/98 followed by 10/8/98. If you try to sort faxes by the number of pages they contain, 3-page faxes curiously show up after 28-page faxes.

Macworld's Buying Advice

STF Technologies has done a good job of improving a powerful but nonintuitive product. With version 5.0's revamped user interface and the addition of gray-scale viewing, editing, and cover-page features, Faxstf Pro has at last earned a place on your desktop.—TOM NEGRINO

RATING: ♦♦♦♦ **PROS:** Vastly improved interface; excellent fax viewing and editing; good cover-page editing. **CONS:** Conversion bug with Faxstf 3.2 phone books, poor sorting in FaxBrowser. **COMPANY:** STF Technologies (660/463-2021, www.stfinc.com). **LIST PRICE:** $79.95

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Interactor Pro 1.2

BRILLIANCE MARRED BY LAPSES

TODAY'S WEB BROWSERS GIVE designers more multimedia muscle than ever before, but some tasks—such as creating user interfaces that incorporate sound effects or games containing complex animation—still demand a multimedia authoring program. When most people think of plug-in–based Web interactivity, they think of Macromedia Director and its Shockwave technology. But there are alternatives, such as mBed Software's Interactor Pro.

Like Director, Interactor Pro lets you create interactive multimedia projects that can run within a browser or by themselves. But Interactor Pro's unique approach to mixing media makes it possible to implement tricks that would be difficult or impossible in Director.

Handling the Media Interactor Pro's handlers look much like scripts (bottom-right window), but you create them by choosing options from pop-up menus.

Like any authoring program, Interactor Pro lets you import media elements, such as graphics and sounds, created in other programs. You can position elements within a layout window, and you can animate elements by drawing Bézier animation paths. You can also make your project interactive using *handlers*, a script-like feature you create by choosing options from pop-up menus (see "Handling the Media").

Besides text and graphics, Interactor Pro can import QuickTime movies, sound files (.au, .wav, and MIDI formats), and streaming RealAudio clips. The Windows version also supports RealVideo clips; the Mac version doesn't. Neither version supports QuickTime VR.

Unlike Director, Interactor Pro lacks built-in paint and text-editing features.

Having to import media elements created elsewhere isn't a big drawback, but Interactor Pro's limited file-format support is frustrating. Graphics must be saved in GIF or JPEG formats, so you'll need to endure frequent conversion hassles during development and prototyping.

Interactor Pro can create antialiased text on the fly, supports scrollable text fields, and can import text from external files. Alas, your font choices number exactly two—Times and Helvetica—and there's no character-level spacing control. mBed Software says it plans to improve text formatting in future versions.

The result of your efforts is an *embedlet*, a text file containing a set of HTML-like tags describing your project's media elements, animations, and interactivity. This separation of media elements and the code that controls them introduces some genuinely cool possibilities. You could program a database manager or CGI to create embedlet files that present the same media in different ways depending on certain conditions, or design a hybrid Web/CD-ROM project, using the Web to supply fresh embedlets that access media on the CD. To distribute projects on a CD-ROM, you must purchase a $399 run-time kit.

When you save an embedlet, Interactor Pro also creates an HTML page containing playback tags. This code contains a large JavaScript script that determines whether the mBed plug-in or ActiveX control is installed on a user's machine, downloading it if needed. The script works but isn't as flexible as the scripts that Macromedia Director's After-Shock utility generates.

Macworld's Buying Advice

mBed Interactor Pro is the wrong choice for projects that require QuickTime VR or fancy text formatting, but it's a strong contender for most other forms of advanced Web interactivity, and a great choice for creating dynamically updated projects.—JIM HEID

RATING: ♦♦♦½ **PROS:** Straightforward design; innovative separation of control and content; excellent RealAudio support. **CONS:** No QuickTime VR support; no RealVideo support on Mac; extremely limited font control; weak documentation. **COMPANY:** mBed Software (415/778-0930, www.mbed.com). **LIST PRICE:** $799.

SonicWall 1.8

VERSATILE, LOW-COST FIREWALL

FIREWALLS, ONCE COMPLEX AND expensive devices, have finally approached the point of near-universal affordability. Sonic Systems' SonicWall 1.81 dedicated network appliance—a low-cost version of the company's Interpol (see *Reviews*, March 1998), with a modified feature set and an enormously trimmed price—supports access protection, dynamic address configuration, network-address translation, public-server connectivity, remote telecommuting, and optional content filtering.

Administered using a Web browser, it's a snap to set up and maintain. The simple modem-size box sports two Ethernet ports and a handful of status lights; you connect one port to your Internet router and the other to your LAN hub. Configuration takes just minutes using any Web browser, following instructions in the well-written user's guide.

ARNOLD TIOSEJO

The SonicWall's Web- and Java-based administration tool displays a main status page summarizing your configuration, any error messages, and the current network status. The interface includes a detailed message log, which can be e-mailed to you on a regular basis, and access to the SonicWall's other configuration features. The basic configuration uses a single page: enter the IP addresses of your router, network, and DNS server, and you're done. An optional Dynamic Host Configuration Protocol (DHCP) server can remotely configure TCP/IP settings on your Mac and PC computers, assigning their IP, gateway, and DNS addresses automatically.

The SonicWall operates either in screening mode, where your users all have Internet-routable IP addresses, or in network-address-translation (NAT) mode, where your users all get private addresses. In screening mode, telecommuters can log in through the firewall; the more-secure NAT mode prohibits telecommuter access and requires only a single Internet-routable IP address.

By default, the SonicWall blocks all incoming connections to computers on your LAN but permits all outgoing connections, giving your users transparent network access without direct Internet exposure. The unit also protects your LAN from known denial-of-service attacks; Sonic provides free online firmware updates when protection enhancements become available. You can also optionally open holes in the firewall for individual FTP, SMTP, POP3, DNS, and HTTP servers on your LAN. A dynamic port-configuration option lets you create access for other protocols at will.

An optional self-updating content filter lets you monitor or block access to 12 predefined content categories, such as pornography or violence, and is customizable to permit or exclude sites you specify. You can also block all Usenet news access and disable Java and ActiveX applets, as well as HTTP cookies.

During tests, the SonicWall/Unlimited model—which supports any number of users—performed flawlessly, with no perceptible speed degradation on a 100-client network accessing the Internet through a 3-Mbps connection. Sonic sells the SonicWall/10 and SonicWall/50, allowing 10 and 50 users, respectively. You can upgrade these units for more users by purchasing an unlock code from Sonic Systems.

Macworld's Buying Advice

The SonicWall offers excellent all-in-one Internet protection, with features rivaling those of products costing ten times as much. Sonic has addressed all of the Interpol's previously noted limitations and dropped the price dramatically as well. It's a near-flawless product and clearly the best in its class.—MEL BECKMAN

RATING: ♦♦♦♦♦ **PROS:** Web-configuration interface; translates network addresses; built-in DHCP server; optional content filtering; excellent performance. **CONS:** None significant. **COMPANY:** Sonic Systems (408/736-1900, www.sonicsys.com). **LIST PRICE:** SonicWall/10, $495; SonicWall/50, $995; SonicWall/Unlimited, $1,495; content-filtering subscription, $175 to $495 per year based on number of users.

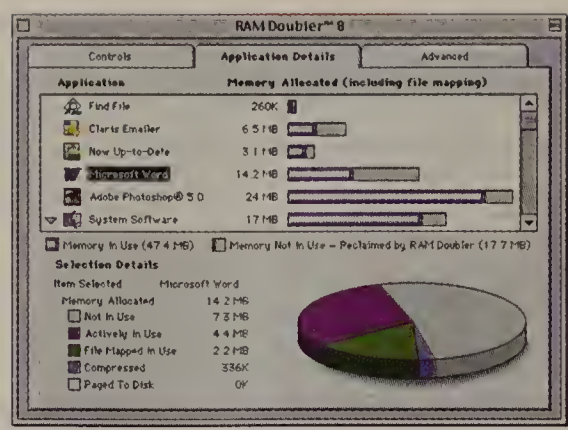
RAM Doubler 8

TOP-SELLING UTILITY GETS MINOR COMPATIBILITY TWEAKS

DESPITE THE GIGANTIC LEAP forward implied by its version number, there's little new in Connectix's RAM Doubler 8. With this upgrade, RAM Doubler neatly bypasses versions 3 through 7, but it's essentially the same popular, simple control panel that lets you open two or three times as many programs simultaneously as you could without it (see *Reviews*, December 1996). Although the upgrade includes minor changes, Connectix recognizes that RAM Doubler 8 is at heart a compatibility upgrade; the updater is a free download for registered users.

RAM Doubler 8's most significant new feature is compatibility with Microsoft Office 98, which behaved crankily with RAM Doubler 2. Connectix claims that RAM Doubler 8 is faster, too, although the speed penalty imposed by the program was already a nearly unnoticeable 2 percent.

The upgrade's only other change is a revamped control-panel interface, which now shows detailed statistics and graphs. Although attractive, the charts prove nearly incomprehensible, featuring such highly technical labels as Total Logical Address Space and File Mapped in Use. Alas, the stiffly written manual is no help; for example, it defines Backing Store File Size as "The size of the current backing file."



Do the Math RAM Doubler 8's control-panel interface is different but not necessarily better.

Still, Connectix must be starting to sweat. If you've got a Mac with 32MB of RAM, you can double your physical RAM (with a 32MB chip) for about $50. Why mess with $75 software that only simulates that arrangement? Furthermore, the average Mac's RAM complement has been escalating faster than software's need for it; if you've got 64 or 128 megs of RAM, RAM Doubler's appeal is greatly diminished from the days when 16MB was considered generous. And if your Mac has 256MB of RAM—RAM Doubler's ceiling—the program does absolutely nothing for you (except to free up 257MB of disk space you might otherwise give up to virtual memory).

Fortunately, there are still millions of RAM-impaired—and hard-to-upgrade—Macs that could benefit from RAM Doubler's blissfully simple update. Moreover, Connectix is fully prepared for Apple's iMac (see review in this issue)—the company ships its tiny, 258K product on a 650MB CD-ROM; PowerBook owners can call for a free floppy-disk version.

Macworld's Buying Advice RAM Doubler is as superb as ever; all that's changed is the times. If you need another 32MB of memory, buying real RAM costs less and gains you more speed. But if you'd like to take advantage of RAM Doubler as a space-saving virtual-memory alternative, or if you're shy about opening up your Mac, RAM Doubler remains a relatively inexpensive means of tripling the mileage of the memory you already have.—DAVID POGUE

RATING: ♦♦♦♦ **PROS:** Still works great; now compatible with Microsoft Office. **CONS:** Manual—and new memory graphs—geeky and unhelpful. **COMPANY:** Connectix (415/571-5100, www.connectix.com). **LIST PRICE:** $75.

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Kai's Power Show

PUMP UP PRESENTATIONS WITH EFFECTS

KAI'S POWER SHOW LETS YOU transform dull slide shows into crowd pleasers by adding animated transitions and sound effects. Although its text-handling features are disappointing, Power Show is a great value. As with other MetaCreations software inspired by graphics guru Kai Krause, Power Show sports a delightful but unconventional interface.

Power Show's major functions are arranged into four separate work areas, or "rooms." The In room lets you import individual image files, QuickTime movies, or entire folders of images and movies. You can also acquire images from a scanner or digital camera. If you're in a hurry, a handy QuickShow shortcut turns your slides into a presentation in only a few mouse-clicks. Power Show's Windows version reads native Microsoft PowerPoint files; alas, this feature isn't supported on the Macintosh, although you can import PowerPoint slides if you save them as individual graphics files.

In the Sort room, you select the slides for your show. As you add frames, they appear in a horizontal sorter at the bottom of the screen. Unfortunately, if you're working with more than a few images, you have to scroll among them. (Slides also appear as tiny thumbnails below the sorter, but they're often too small to recognize.)

Slide FX Five unmarked buttons in Kai's Power Show's In Transition dialog box let you save your favorite slide-changing effects.

You add visual transitions, sounds, and text animations in the Edit room. Transition effects range from wacky to spectacular. Power Show also includes a generous selection of WAV sound clips that you can play between frames, and you can import your own sounds or specify audio-CD tracks to accompany a presentation.

Paradoxically, text handling is Power Show's strongest and weakest point. In the Edit room, you can add text to your slides and apply special effects to text, but you can't import text into a presentation. (The text on imported PowerPoint slides can't be edited or animated, either.)

When you're done, the Out room lets you print or save your presentation in Power Show's native format or as an HTML file. You can also package your slides along with a Mac or Windows player to distribute your show to others.

For an application aimed at home and small-business users, Power Show requires a surprising amount of RAM; even the suggested allocation of 32MB wasn't always sufficient.

Macworld's Buying Advice Kai's Power Show is an excellent low-cost choice for creating or spicing up digital slide shows that consist primarily of images. If Power Show could import text, it might easily become an indispensable desktop presentation tool.—FRANKLIN TESSLER

RATING: ♦♦♦½ **PROS:** Inexpensive; dazzling transition and text-animation effects. **CONS:** No text import; high RAM requirement. **COMPANY:** MetaCreations (805/566-6200, www.metacreations.com). **COMPANY'S ESTIMATED PRICE:** $50.

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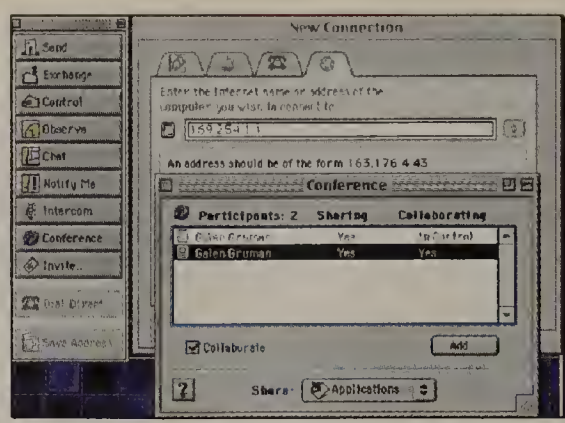
ADDS LIMITED NETMEETING SUPPORT

NETOPIA'S TIMBUKTU HAS LONG been a must-have utility for Macs that need to connect to other systems. Cross-platform functions like file sharing, remote observation, and voice and text chatting have long helped Timbuktu serve as a capable help-desk troubleshooting tool, remote-management/access utility, and ad hoc network creator. Timbuktu Pro 4.5 adds yet another connection option: T.120-standard conferencing. In practical terms, this capability lets Timbuktu users connect to conferences hosted by Microsoft NetMeeting, a product bundled with Microsoft Internet Explorer 4.0's Windows version.

Alas, your Mac won't be an equal NetMeeting partner, even if the Mac is the conference host. Timbuktu Pro 4.5's conferencing features don't support most of NetMeeting's capabilities: you can't see whiteboards or video, you can't hear audio, and you can't exchange files. For Mac users to take advantage of these key features, PC colleagues need to have Timbuktu Pro 32 installed and use its functions in place of NetMeeting's for these tasks. (For basic conferencing, though, the PCs don't need



Meet Me on the Web With Timbuktu Pro 4.5's support for NetMeeting conferences, you can collaborate over the Internet or a TCP/IP-based network.

Timbuktu; so long as the Mac and the PCs are accessible to each other via a TCP/IP connection, you can see—and even work on—live files running on other conferees' PCs, and vice versa.)

If you're not working with NetMeeting users, Timbuktu Pro 4.5 doesn't provide much more than what version 4.0 did. Netopia tweaked the program's Intercom audio service for better sound fidelity, added an Invite option to let other users control the host Mac's Timbuktu services, and included an option in the Observe and Control windows to shrink your view of the remote user's screen.

Like previous versions, Timbuktu Pro 4.5 sports a scattered, confusing interface with numerous screen-cluttering dialog boxes and menus—a long-standing source of complaint. Documentation is also shockingly slim. Manuals offer no real useful information—a major issue considering that remote access and networking often require knowledge that many users won't have. Nothing explains how to configure systems linked via Ethernet so that they will also be available to each other via TCP/IP.

Macworld's Buying Advice Timbuktu Pro remains a superior program for managing, collaborating with, and exchanging information between remote systems. It's a must-have utility for network administrators and small-office users who need to create ad hoc networks. But version 4.5 offers little that its predecessor didn't, and its much-touted NetMeeting capabilities are, at best, half-baked.—GALEN GRUMAN

RATING: ♦♦♦♦ **PROS:** Rich set of tools for remote management, information sharing, and collaboration; lets Macs connect to Windows NetMeeting conferences. **CONS:** Limited NetMeeting support; awkward user interface; poor documentation. **COMPANY:** Netopia (510/814-5000, www.netopia.com). **LIST PRICE:** $67 to $149 per user, depending on the number of users.

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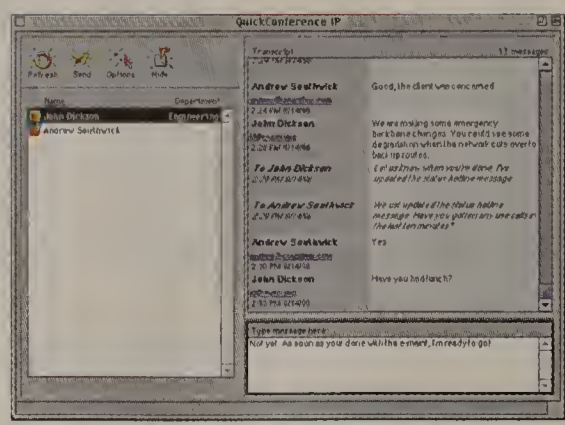
QuickConference IP

SPEEDY REAL-TIME COMMUNICATION

E-MAIL IS GREAT FOR INTEROFFICE communication but isn't always fast or convenient enough for routine office discussions. Prairie Group's QuickConference IP 1.0.1 (QCIP) rides to the rescue, offering rapid communication by letting you exchange text messages in real time with any number of other users. The Mac and Windows versions ship together on a single CD, giving you cross-platform communication at no extra charge.

QCIP includes a well-written user's guide and a license key for a specific number of simultaneous users. You install the server component on one machine in your network (either Mac or a PC); enter the license key; and type in the name, e-mail address, and password for each user. You then install client software on users' Macs and PCs from the same CD.

Once installed, QCIP displays a messaging window with three panes: one listing users currently available for discussion, one with a complete transcript of messages you've exchanged, and one in which you type the next message to send. Operation is intuitive and simple: you click on the names of one or more users, type your message, and press enter. QCIP immediately notifies the recipients of your message, with an alert sound or flash, and can optionally open the QCIP messaging window to display your message. Recipients reply by typing in the message pane and pressing enter, and the response goes to the complete group of recipients you initially chose. For quick and simple messaging, it doesn't get much easier than this.



Talk the Talk QuickConference IP 1.0.1 lets users carry on text conversations in real time from wherever they may be on the network.

Beyond this basic capability, QCIP's features are few. With their user name and password, users can log in from any QCIP-capable workstation and then converse with others from that location; a do-not-disturb option lets users temporarily block incoming messages. You can change the size (but not the font) of displayed text, and a programmable hot key lets users bring QCIP's window to the fore in a single keystroke. Users (but not the server) can save a copy of their message transcript.

Desirable but missing features include user groups, for making large user lists manageable; configurable alert sounds (the one supplied sounds exactly, and confusingly, like a telephone); and the ability to send a priority alert to wake up sleepy correspondents.

Macworld's Buying Advice QuickConference IP 1.0.1 does its basic job very well, and a small group with a dozen or so users will find the program immediately useful. But the dearth of configurable preferences forces everyone into the same dreary, and not terribly well-thought-out, mold. Although QCIP is usable as is, just a little attention to user convenience would make it a first-rate messaging tool.—MEL BECKMAN

RATING: ♦♦♦ **PROS:** Easy installation; savable transcripts; do-not-disturb feature. **CONS:** No grouping of users; can't configure alert sounds; no message priorities. **COMPANY:** Prairie Group (515/225-2422, www.prgrsoft.com). **LIST PRICE:** $119 for five users; other quantities available.

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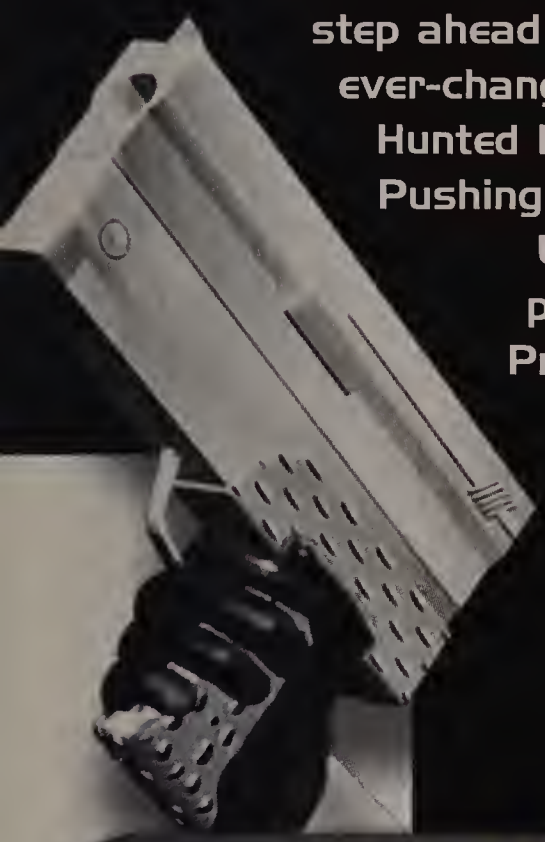

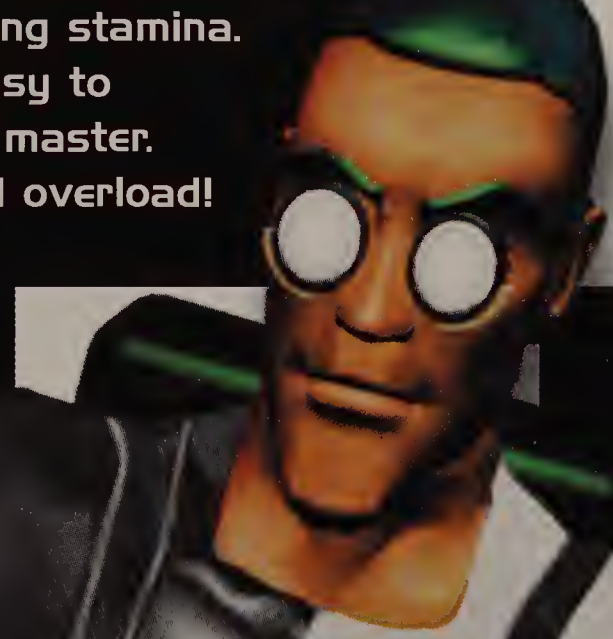

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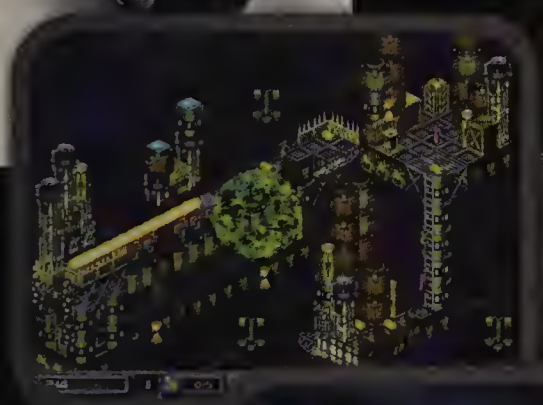

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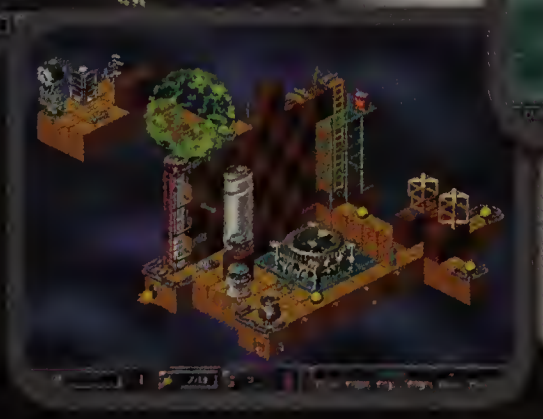

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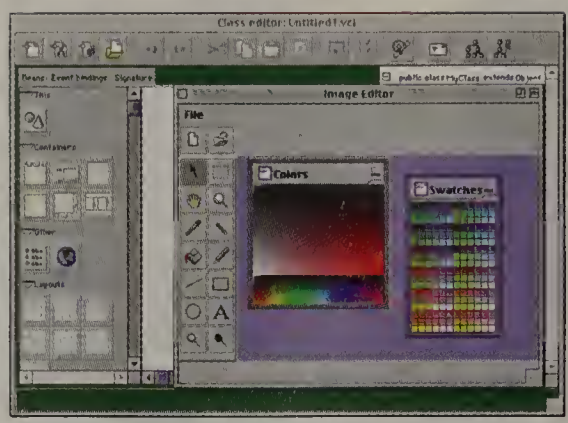
Visaj 2.0

UNIX JAVA TOOL COMES TO THE MAC

YEARS AGO, IMPERIAL SOFTWARE Technology (IST) started out making graphical-interface–building tools for Unix-based systems. The rise of the Web meant a migration to Java-based tools, and from Java tools it was a few short programming steps to both Windows and the Mac OS. So Visaj, a graphical Java-application development tool, arrives on the Mac as a highly evolved version 2.0, benefiting from three years of Java refinement. This first Macintosh version of Visaj is remarkably stable and shows only a few traces of its Unix-then-Windows-then-Mac history.

Using Visaj, you drag elements from palettes into a visual program editor. The palettes contain most of the elements you'd want in a Java applet or application—including basic interface elements such as windows, menus, and scroll bars—as well as a standard Java Development Kit and third-party JavaBeans.

The editor window displays your project classes in a hierarchy that automatically rearranges as you add and remove elements. Event-binding takes place in a separate editing module, while images (JPEG and GIF) have their own editor.



Envisage This Besides its hierarchical component editor, Visaj includes a convenient image editor that handles Java-critical GIF and JPEG files.

Visaj isn't a full-bodied development environment. What's impressive about the program is that it lets you quickly create a worthwhile, good-looking Java application. Unlike more familiar development tools, such as Symantec's Visual Café for Java (see *Reviews*, May 1998) or Metrowerks' CodeWarrior Professional (see *Reviews*, August 1998), Visaj only generates Java code. To compile Java code, you need another tool with a full integrated development environment (IDE).

Visaj's strength is its ability to let you make usable Java code by rapidly mixing "beans and diamonds." Its drag-and-drop style lets you assemble complex programs faster than you can in CodeWarrior, and its generous assortment of proprietary classes goes beyond what's available in Visual Café.

Although IST traditionally maintains a vigorous upgrade schedule, Visaj 2.0 has one problem that is unlikely to be corrected soon: it's slow. The program is written in Java for its intrinsic cross-platform capability, but that design decision imposes a speed penalty that's hard to ignore. Scrolling within windows is annoyingly slow, and file handling needs to be quicker.

Macworld's Buying Advice Paradoxically, although Visaj 2.0's performance is slow, the program's development cycle is fast, a key issue when creating applications under contract deadlines. If you work with Java professionally, you should spend at least some time stepping through the tutorial in the free trial version (available on IST's Web site) to see what acceleration Visaj can offer your own projects.—CHARLES SEITER

RATING: ♦♦♦½ **PROS:** Lets you assemble feature-rich Java programs quickly using the provided components and visual editor. **CONS:** Needs more operational speed. **COMPANY:** Imperial Software Technology (650/688-0200, www.ist.co.uk). **LIST PRICE:** $495.

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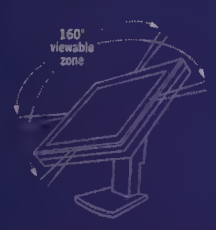

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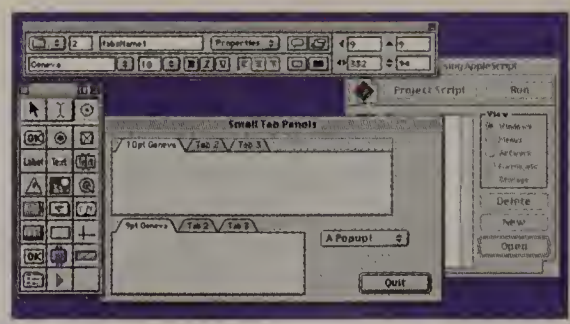
FaceSpan 3.0.1

RICH INTERFACES FOR APPLESCRIPT APPS

THE MAC'S EASE OF USE HAS always had an invisible price: creating software with a good user interface is complicated. Although AppleScript's relative simplicity brought programming within reach of ordinary users, the program's built-in features can't create more than rudimentary user interfaces. Digital Technologies' FaceSpan 3.0.1 solves this problem, providing all the tools necessary to quickly and easily create rich user interfaces for software written in AppleScript.

AppleScript has often been maligned because it's so slow, but its ability to integrate disparate programs makes it uniquely suited to automating tedious, complex processes, such as retrieving data from one application and inserting it into another. With Mac OS 8.5, Apple is slated to make AppleScript Power Mac–native, giving it—and tools such as FaceSpan—a big boost.

FaceSpan isn't aimed at professional developers, though an understanding of programming basics helps. A minimalist tutorial explains FaceSpan's basic user-interface elements and how to tie them together. Strangely enough, the tutorial's sample scripts use the far-from-ubiquitous QuarkXPress as their target application.



Drag and Drop Creating an interface in FaceSpan is as simple as picking elements from the tool palette and dropping them into a window's background.

FaceSpan uses the project metaphor common to development environments; a project contains all the information needed to produce the final software. A new project contains a basic collection of menus and a default AppleScript. You add interface elements, such as buttons and scroll bars, by dragging them from the tools palette into the project window, which displays a list of your project's elements. FaceSpan 3.0 supports the Mac OS Appearance Manager and its user-interface elements.

Once the visual layout is complete, you can attach scripts to individual interface elements. FaceSpan's built-in script editor lets you edit AppleScripts, which can control your FaceSpan application or any other AppleScript-able application.

FaceSpan's two main drawbacks aren't really its fault. AppleScript is inherently object oriented, so a project's scripts—most of which are attached to individual user-interface elements—are distributed throughout the project. Without an overview feature, complex projects quickly become unmanageable. Additionally, FaceSpan's breadth of features seems overwhelming at first, but the program ultimately proves quite easy to use.

Macworld's Buying Advice AppleScript puts the ability to automate complex repetitive tasks within the reach of typical Mac users, and FaceSpan lets you quickly customize scriptable applications, complete with all the elements of a good graphical user interface. It's taken many years for software developers to integrate AppleScript awareness into their software; FaceSpan is a useful tool for taking advantage of this scriptability.—STEPHAN SOMOGYI

RATING: ♦♦♦½ **PROS:** Comprehensive user-interface–creation tools; supports the Appearance Manager. **CONS:** Rudimentary tutorial; complex projects can become overwhelming. **COMPANY:** Digital Technology International (801/226-2984, www.facespan.com). **LIST PRICE:** $199.

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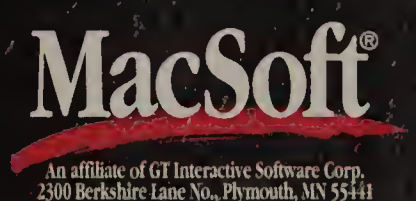

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Removable Cartridges Are an All-Purpose Storage Solution—But Are They Right for You?

by Rik Myslewski

Sooner or later, your files will be forced to make a perilous journey. One by one you'll drag them—kicking and screaming, if files could kick and scream—from the cozy safety of your Mac's well-protected hard drive and thrust them out into the horrible dirt, dust, heat, humidity, and unknown dangers of the outside world.

You're not cruel. You're just doing what you have to do: transferring files to a colleague or service bureau, reclaiming needed storage space, backing up your hard disk, archiving important data for future reference, or securing sensitive information. But whatever your reason for moving your files out from the protective nest of your Mac's hard drive, make sure you pick the right transportation—the files you save may be your own.

FILES ON THE MOVE

The easiest and cheapest way to move files from place to place is, of course, over your local area network or the Internet. Sometimes, however, such a secure method of file transport is simply impractical. Start e-mailing 100MB projects to your neighborhood service bureau on a regular basis, for example, and we doubt you'll remain one of its favorite customers. Archive a gaggle of gigabytes across your network onto a server every night, and you'll soon be investing heavily in network hardware or interviewing candidates for a new IS staff.

Enter Removables As convenient as electronic file-transport may be, it's often more practical to use a removable-cartridge drive. Whether the drive you choose stores data on spinning magnetic or optical media, or on a reel of tape, your part of the process is the same: slap a cartridge into the drive, write files onto it, pop the cartridge out of the drive, and then physically pick it up and carry

PHOTOGRAPHS BY SCOTT PETERSON

it away. The cartridge-and-drive combination you choose, however, should depend on *why* you're moving the files in question: for file transfer, expandability, backup, archiving, or security.

Of the three major types of removable-cartridge drives—magnetic, magneto-optical, and tape—the familiar magnetic-media drives from Iomega and SyQuest are the most versatile. They're fast enough for quick backups, and so many of them are in use—especially Iomega's omnipresent $140 Zip 100—that there's a high probability the person to whom you're sending the file-bearing cartridge will have a drive that can read it.

Reliability Concerns There's one problem, however, and it's a big one. These popular removable-cartridge drives are necessary evils. They're necessary because they've become the de facto standard for swapping large files; they're evil because they're inherently more failure-prone than a common, garden-variety hard drive.

So, when is the risk worth it? To help you match the right technology to your needs, Macworld Lab assembled a group of removable-cartridge drives and put them through a battery of tests, including the disk tests from Ziff-Davis Benchmark Operation's new MacBench 5.0 (see the sidebar "Introducing MacBench 5.0").

Iomega's Jaz 2GB is a stylish, speedy magnetic-media drive.

DUELING DRIVES

Removable-cartridge drives based on magnetic technology fall into two categories: those with cartridges that enclose a flexible, floppy-like disk, and those that use rigid metal platters much like what you'd find in standard hard-disk drives. As you might assume, the former provide significantly less storage space than the latter.

Magnetic Media We looked at two flexible-media drives: Iomega's (www.iomega.com) nearly ubiquitous $140 Zip 100 and Winstation's (www.winstation.com) nearly unknown $249 SCSI SuperDisk, which is based on Imation's LS-120 drive and accepts both standard 1.44MB floppy disks and proprietary 120MB cartridges.

Rigid-media drives were represented by an assortment of Jaz 2GB drives—from Iomega, APS Technologies (www.apstech.com), and LaCie (www.lacie

Data Destinations: Removable-Media Drives Compared

Company	Product	Mouse Rating	Phone	Company's Estimated Price [A]	Media Price [B]	Technology	Maximum Usable Capacity	Cost per Megabyte [C]	Comments
MAGNETIC DRIVES									
APS Technologies	EDITORS' CHOICE Jaz 2GB Pro	♦♦♦½	816/483-1600	$400	$100	3.5" rigid-magnetic	1.8GB	5.4 cents	Sturdy case has unique temperature-control circuitry.
Iomega	Jaz 2GB	♦♦½	801/778-1000	$399	$100	3.5" rigid-magnetic	1.8GB	5.4 cents	Overpriced and underengineered—you get more from APS and LaCie.
	Zip 100	♦♦♦½	801/778-1000	$140	$17	3.5" flexible-magnetic	94.1MB	18.0 cents	Once-groundbreaking drive is beginning to show its age.
LaCie	2GB EKO External Jaz	♦♦♦	503/844-4500	$400	$100	3.5" rigid-magnetic	1.8GB	5.4 cents	An improvement over the Iomega Jaz 2GB is marred by poor fit and finish.
	2GB d2 External Jaz	♦♦♦½	503/844-4500	$400	$100	3.5" rigid-magnetic	1.8GB	5.4 cents	No frills, nothing fancy—the d2 is just a solid, well-built drive.
SyQuest	SyJet	♦♦♦½	510/226-4000	$250	$66	3.5" rigid-magnetic	1.4GB	4.6 cents	The future of this speedy, low-cost drive is clouded by SyQuest uncertainty.
Winstation	SCSI SuperDisk	♦♦	509/765-7759	$249	$12	3.5" flexible-magnetic	118MB	10.1 cents	This slow drive offers little unless you need to swap LS-120 cartridges.
OPTICAL DRIVES (REFERENCE)									
APS Technologies	CDRW Pro	NA	816/483-1600	$600	$2	3.5" CD-R/CD-RW	650MB	0.3 cents, CD-R; 3 cents, CD-RW	
Fujitsu	DynaMO 640SE	NA	408/432-6333	$349	$20	3.5" magneto-optical	602MB	3.3 cents	
Pinnacle Micro	Ultra 5.2	NA	949/789-3000	$2,249	$159 [D]	5.25" magneto-optical	4.8GB	3.2 cents	

NA = not applicable. [A] Includes one cartridge. [B] Cost per cartridge in pack of three. [C] Based on maximum-capacity media. [D] Per-cartridge price in five-pack (single-cartridge price, $169).

.com)—plus SyQuest's (www.syquest.com) $250 SyJet.

Since the Iomega Jaz 1GB and the SyQuest EzFlyer 230 won't be sold much longer, we omitted them from this report. But if you already own one of these drives, don't fret: Iomega and SyQuest assured us that they'll continue selling cartridges for these orphaned models as long as demand continues—and why not? As King C. Gillette discovered years ago, there's more profit to be made in blades than in razors.

Unfortunately, a Mac-compatible version of SyQuest's most recent entry into the removable-cartridge wars, the 1GB SparQ, hadn't been released in time for this article—and while SyQuest has announced a USB SparQ for the iMac, the company is mum on the possibility of a SCSI SparQ for other Macs. However, testing of a PC-compatible version shows that the drive performs comparably to the Iomega Jaz 2GB—and with a drive price below $200 and a cartridge price about one-third of a Jaz 2GB cartridge's, the SparQ might well be a formidable competitor to the Iomega drive.

Optical Alternative For reference purposes, we also added representatives from magnetic media's major competition: one CD-Rewritable (CD-RW) drive, APS Technologies' $600 CDRW Pro, and two magneto-optical drives, Fujitsu's $349 DynaMO 640SE (www.fcpa.com) and Pinnacle Micro's $2,249 Ultra 5.2 (www.pinnaclemicro.com).

CD-RW technology may not yet be fully mature, but its ability to write to both CD-RW and write-once CD-Recordable (CD-R) media makes it an attractive choice for transferring large files, creating low-cost audio CDs, archiving data, and backing up your hard drive. (For a full discussion of CD-R and CD-RW drives, see "Burn, Baby, Burn," September 1998.)

Magneto-optical drives also have their strong points and rabid supporters (see the sidebar "Slow but Steady: The Case for Optical Drives").

THE RIGHT TOOL FOR THE JOB

There are five major uses for a removable-cartridge drive: file transfer, expandability, backup, archiving, and security. After completing our tests, we came to strong conclusions about which technology is most appropriate for each use.

File Transfer Here's where magnetic-media drives shine. The reason is simple: they're everywhere. They're on your coworker's desk, in your home and office systems, and down at your neighborhood service bureau.

The most common magnetic-media drive is, of course, the floppy drive: up until the iMac, every Mac had one. Imation, betting that iMac buyers will want the convenience of this tiny but universal file-transfer medium, will offer users an iMac-compatible USB version of its LS-120 SuperDisk drive. The SuperDisk drive accepts both standard floppies and 120MB SuperDisk cartridges. If you have a standard SCSI-equipped Mac and want to swap LS-120 cartridges with your iMac-equipped friends, you have one choice: the Winstation SCSI SuperDisk drive.

Be warned, however: SuperDisk technology manages to double as both a floppy drive and a 120MB-cartridge drive because it merely adds an optically guided read/write head to a floppy-drive mechanism. The result? Absolutely languid performance (see the benchmark, "Ready-to-Go Removables"). Also, the SCSI SuperDisk drive costs almost twice as much as its prime competition, the Iomega Zip 100.

The convenient, inexpensive, and sometimes unreliable Zip 100 drive has been hailed and reviled nearly as much as that guy in the White House—and with 15 million Zip drives out there, it's equally hard to ignore. At less than half the speed of a Jaz 2GB drive, the Zip hardly lives up to its name, but for transferring files smaller than 100MB it's a handy solution. And even if a Zip disk becomes unreadable, it's still cheap and easy to replace.

Affordability is not a virtue, however, of the Zip's big brother, Iomega's $399 Jaz 2GB. Although its price has dropped significantly from the astronomical $649 that Iomega demanded when the Jaz 2GB first appeared, the drive is still more expensive than the $250 SyQuest SyJet or the soon-to-appear $200 SyQuest SparQ. The SyJet is essentially as fast as a Jaz 2GB, and both the SyJet and its media are less expensive.

All Jaz 2GB drives—whether Iomega's or models such as the ones from APS Technologies and LaCie (all $400)—do offer the convenience of let-

The Cartridge Crystal Ball

Storage technology continues to follow a familiar evolutionary path: bigger, faster, cheaper. Take the humble floppy drive's latest competitor, for example. Sony's new (and currently Windows PC–only) HiFD drive not only reads and writes to familiar 1.44MB 3.5-inch floppies but also accepts proprietary cartridges that, when formatted, hold a spacious 200MB.

The Iomega Jaz 2GB may have new competition as well. Castlewood Systems, headed up by SyQuest founder Syed Iftikar, is trumpeting its upcoming $199 Orb drive, promising that it'll use MR (magneto-resistive) technology to cram 2.16GB on a $30 single-platter 3.5-inch cartridge. Speed claims are impressive, nearly double that of the Iomega Jaz 2GB. Originally scheduled to ship this spring, the Orb is now expected to arrive by the end of this year.

Also likely to ship in the immediate future is the SyQuest Quest. Its 5.25-inch cartridges will hold 4.7GB—the same capacity that allows a DVD disc to contain a full-length film or nine-plus hours of CD-quality audio.

TeraStor has recently announced the first drives to use its proprietary *near field recording* technology, a magneto-optical hybrid that allows for extremely high-density discs. The two drives—one due late this year, the other next year—will use 5.25-inch removable cartridges that will hold 10GB and 20GB, respectively, on a single side.

And several manufacturers are developing writable DVD drives, but until the plethora of competing DVD standards gets sorted out, we wouldn't call this a practical solution. (See the feature "DVD: Now Playing?" elsewhere in this issue.)

ting you use your older 1GB Jaz cartridges. However, performance drops precipitously. Our MacBench 5.0 tests showed an average slowdown of about 50 percent from 2GB to 1GB, and Dantz Retrospect backups took almost three times as long to complete.

Finally, though CD-R isn't the best solution for file transfer—once you've put files on a CD-R disc, they're there forever—CD-R does have the advantage of being compatible with everyone's CD-ROM drive.

Expandability Until recently, one of the prime virtues of removable-cartridge technology was that it opened up the golden road to unlimited storage capacity: Run out of room? Just add another cartridge. But times have changed.

All you have to do is take a quick look at the ads in the back of *Macworld* to discover that hard drives are now (relatively) cheap. You can buy a 9GB hard drive for around $600, and 4GB units cost a bit over $300. Do the math: buy a Jaz 2GB drive with one 2GB cartridge for around $400, then add a three-pack of 2GB cartridges for an additional $300. Compared with buying a $600 9GB hard-disk drive, you've just paid $100 more for 1GB less space.

Hard drives also come out on top in terms of speed. Even the fastest removable-storage drive we tested wasn't half as fast as MacBench 5.0's reference drive—the stock internal drive on the Power Macintosh G3/300.

Most important, remember that hard drives are far more reliable than any magnetic-media removable-cartridge drive and are designed specifically to be run for extended periods of time. Economics, speed, and safety dictate that if you simply want to expand your storage capability, buy a bigger hard drive. Or two.

Backup The most important task of a backup system is to perform flawlessly in your time of crisis. Few things in the world of computing are as distressing as experiencing a hard-drive crash and then discovering—even though you have been religiously performing your daily backup ritual—that your backed-up files are themselves unrecoverable. Above all, a backup system needs to be reliable, rugged, and crash-free.

Because of their less-than-sterling reliability, no magnetic-media drive is an ideal backup system. However, any backup is better than no backup, so if your only removable-cartridge drive is a SyJet, Jaz, Zip, or SuperDisk, by all means use it to back up your system. But take all the nec-

Macworld LAB TEST

Ready-to-Go Removables

In terms of speed, the Jaz 2GB drives and the SyJet reign supreme. However, the Jaz 2GB is hobbled when it has to deal with 1GB cartridges. While the Iomega Zip 100 drive is markedly slower than the Jaz, it's still much faster than Winstation's floppy-compatible SCSI SuperDisk drive. The optical drives we tested for comparison lagged behind all but the SuperDisk in almost every test.

Best overall performance. Bold indicates best result in a subsystem test. Editors' Choice winner's name in red. For results in seconds, shorter bars are better. Higher numbers for MacBench 5.0 scores are better. MacBench 5.0 scores are relative to those of a Power Macintosh G3/300, which is assigned a score of 1,000 in each test. For more information on MacBench 5.0, see the sidebar "Introducing MacBench 5.0."

	TIME (in seconds)				MACBENCH 5.0	
	Copy 20MB File to Drive	Open 20MB Photoshop File	Save 20MB Photoshop File	Retrospect Backup	Disk Test	Publishing Disk Test
Magnetic drives						
APS Technologies Jaz 2GB Pro	12	22	16	75	377	278
Iomega Jaz 2GB with 2GB cartridge	11	22	12	64	**411**	**321**
Iomega Jaz 2GB with 1GB cartridge	24	32	32	179	237	139
Iomega Zip 100	23	41	29	209	108	NA*
LaCie 2GB EKO External Jaz	15	22	17	74	379	277
SyQuest SyJet	**10**	23	13	**59**	359	323
Winstation SCSI SuperDisk	74	78	81	557	57	NA*
Optical drives (reference)						
APS Technologies CDRW Pro**	74	37	NA	277	NA	NA
Fujitsu DynaMO 640SE	37	23	41	129	171	99
Pinnacle Micro Ultra 5.2	31	36	42	345	117	86

*NA = not applicable. * Test was not run because drive did not meet minimum free-space requirements for MacBench 5.0. ** 20MB file copies performed with Adaptec's DirectCD 1.02.*

Behind Our Tests

Macworld Lab ran a series of tests to evaluate the performance of each removable-media drive. First we copied a 20MB file from the Finder, opened and saved a 20MB Adobe Photoshop 5.0 document, and backed up 80MB of data to each drive using Dantz Retrospect 4.0. We then ran MacBench 5.0's Disk and Publishing Disk tests for an indication of each drive's read/write capabilities. (MacBench's Disk test is based on market-leading business applications, while the Publishing Disk test uses graphics applications.) All tests were performed with write verification off. Testing was performed on a Power Macintosh G3/300 with Mac OS 8.1, 64MB of RAM, and a 4GB ultrawide hard drive. Display was set to 16-bit color running at 832-by-624-pixel resolution. We tested only one LaCie drive because the company's two Jaz 2GB offerings are functionally identical.—**Macworld Lab testing supervised by Gil Loyola**

essary precautions, such as backing up onto more than one set of cartridges and treating your backup cartridges with more than the usual amount of tender loving care: keep them in their protective cases, don't stack them on top of one another, and don't use them for other purposes.

But if you want—and can afford—the ultimate in convenience and security for desktop backup, look to optical technology: a magneto-optical drive is your best bet. Sure, magneto-optical (MO) drives are slow, but their reliability is light-years ahead of that of any magnetic-media cartridge drive.

Also, don't ignore tried-and-true tape technology. If you're backing up a lot of data, a digital-audiotape (DAT) drive may be the way to go—and you can pick one up for around $600.

Archiving You'd be crazy to use a magnetic-media drive for long-term storage of important data—magnetic-media cartridges are both too expensive and too delicate for reliable long-term storage. You'd be better off using magneto-optical cartridges or CD-R discs, which offer both low media costs and long shelf lives.

On the other hand, if all you want to do is set aside your MacInTax records for the year, or stash away Junior's fifth-grade term project so that you can embarrass him with it later, feel free to slip 'em on a Zip. But remember to take the same precautions that you would if you were using a magnetic-media cartridge for backup.

Security Not that any of us has anything to hide, but sometimes it's a good idea to remove sensitive data from your hard drive and lock it away in a safe place. In fact, it's an even better idea to never put sensitive data on your hard drive in the first place, since sophisticated data-recovery firms such as DriveSavers—or the FBI—can easily track down erased data and can often extract information from drives that have been reformatted or overwritten. Just ask Oliver North.

So if you don't want some predatory divorce lawyer poring over last year's Quicken files, don't put them on a hard drive—use a reliable removable-cartridge drive for sensitive files. And back it up.

SURVEYING THE COMPETITION

Although different removable-cartridge technologies excel at different tasks, few of us have the luxury of buying a magnetic-media drive for file transfer, a new hard

Slow but Steady: The Case for Optical Drives

Americans are hooked on instant gratification. There's no other explanation for the fact that we, unlike nearly all Japanese and many Europeans, have chosen to standardize on fast, risky magnetic-media drives rather than on slower, more secure magneto-optical (MO) drives. The rest of the world seems to agree that it's more important for data to be safely stored on nearly indestructible discs than to save a few seconds after hitting ⌘-S. But not us.

The advantage of MO technology over magnetic-media technology is the former's near imperviousness to dust and shock. It's simply more reliable. But the rap on MO is that it's slow and expensive.

The first charge is true: optical-media drives are much slower than magnetic-media drives. For example, it takes about 10 seconds to copy a 20MB file to an Iomega Jaz 2GB drive; the same file transfer takes a hair over 30 seconds on a Pinnacle Micro Ultra 5.2 MO drive.

The second charge—that MO drives are expensive—proves that when it comes to saving money, most of us don't look past the initial drive purchase. Optical cartridges cost a lot less per megabyte than their magnetic equivalents. Take the beautifully designed Fujitsu DynaMO 640SE, for example, or the built-like-a-brick Pinnacle Micro Ultra 5.2. The former's 640MB cartridges cost $20, and the latter's 5.2GB mega-platters are only $159—that's around three cents a megabyte for both. In contrast, a 2GB Jaz cartridge bought individually costs $125—or nearly 7 cents per megabyte.

So, if they're more cost-effective and reliable than magnetic-media drives, why aren't we all using MO drives? To risk a tautology, the reason that we're not is that we're not—we need to swap cartridges with others, and since magnetic-media drives are the standard (with the exception of CD-R, which has its own set of issues), we buy magnetic-media drives.

Certainly, there are a number of situations in which the speed of magnetic-media removable-cartridge drives is essential. If you're a member of a high-pressure content-creation workgroup, for example, time is money and money pays the rent. But when you're making your nightly backup, take an extra moment to tuck all those expensively produced images safely away onto rugged, reliable magneto-optical cartridges. If you do, your only overnight worries will be about deadlines—not lost data.

They won't win a race, but MO drives are reliable performers.

drive every time we run out of storage space, a DAT drive for personal backup, a CD-RW drive for archiving, and a magneto-optical drive for reliable storage. Most of us ask one drive to tackle all those chores—and since file-transfer needs require us to choose the same drive used by our friends, coworkers, and service bureaus, a magnetic-media drive is often the best choice. But which one?

On the Cheap At the low end, the answer is fairly simple: If you need to transfer files with someone who owns a Zip drive, you need a Zip drive. If you need to transfer files with someone who owns a SuperDisk-equipped iMac or PC (Compaq, NEC, and Gateway all offer SuperDisks), you need a Winstation SCSI SuperDisk drive.

And if you're wary of Zip technology because of all the horror stories you've read on such Iomega-trashing Web sites as The Unofficial Iomega Click of Death Home Page (www.thirdeyesp.com/jatin/iomega/), remember two things: First, considering the number of Zip drives that have been sold, even a statistically tiny number of drive and cartridge failures is enough to spawn a dissatisfied subculture. Second, if you're unlucky enough to become one of those statistics, prepare to be equally dissatisfied. Caveat emptor.

Big Boys Your choices expand if you decide that you can afford a larger-cartridge magnetic-media drive—but not by much. Iomega sells the Jaz 2GB under its own brand and provides mechanisms to APS Technologies and LaCie, which mount Jaz 2GB internal mechanisms in their own cases. APS offers the Jaz 2GB Pro, which is in APS's rugged Pro case. LaCie offers two models: the artsy blue-plastic 2GB EKO External Jaz and the no-nonsense, built-like-a-tank, all-metal 2GB d2 External Jaz.

Of the four Jaz 2GB drives we tested, Iomega's is the fastest, most stylish, and smallest. However, as flashy as the forest-green Iomega Jaz 2GB drive may be—if you like that sort of thing—it's simply not as rugged as the LaCie and APS offerings. Also, a Jaz 2GB cartridge gets hot—very hot—in the no-fan Iomega drive. Although Iomega claims that a Jaz 2GB cartridge can withstand far more heat than is generated by its drive, extreme temperature is the enemy of all magnetic media.

If Jaz compatibility isn't a factor and you're looking for a fast, cost-effective drive, consider SyQuest's SyJet. The SyJet is an excellent product, but SyQuest's August announcement that it was laying off 950 workers and would focus on the SparQ makes us concerned that SyJet drives may soon be a limited commodity.

MACWORLD'S BUYING ADVICE

For the most part, the choice is between four versions of the same technology: the Jaz 2GB. Iomega's Jaz 2GB runs hotter than its competition, and all three of the non-Iomega Jaz 2GB drives have features we prefer over the Iomega offering's: an internal power supply, a competent fan, and standard SCSI ports. (The APS drive has two 50-pin SCSI ports; the LaCie drives have one 25-pin port and one 50-pin port.) The Iomega Jaz 2GB, on the other hand, has an external power brick; no fan; and two high-density, low-profile SCSI ports.

Of the three non-Iomega drives, the APS Jaz 2GB Pro and the LaCie 2GB d2 External Jaz instill far more confidence than the LaCie 2GB EKO External Jaz: the latter's trendy case is less rugged and has annoying fit-and-finish irregularities. The APS Jaz 2GB Pro also has the advantage of its unique ICE technology, which varies fan speed according to cooling needs and flashes a warning LED should the drive get too hot. Although it's of relatively little value in hard drives—which spin constantly and thus give off a steady level of heat—ICE technology turns off the APS Pro's fan when the Jaz 2GB drive isn't being used. The resulting total silence is even quieter than the low noise given off by the fan in the LaCie d2.

In a close race, therefore, the winner by a whisker is the APS Jaz 2GB Pro over the LaCie 2GB d2 External Jaz. The APS drive's hefty, cool-running power supply; spacious case; and ICE technology give its Jaz 2GB mechanism a comfortable, safe environment in which to work.

But remember: when you remove that fast, convenient Jaz cartridge from its drive, give it the kid-gloves handling it requires—or you'll discover how quickly a magnetic-media cartridge can transform itself into a $100 hockey puck. m

Macworld Contributing Editor RIK MYSLEWSKI is managing partner of Smartpeople (www.smartpeople.net), a San Francisco–based technology-consulting group.

Introducing MacBench 5.0

This article marks the beginning of *Macworld*'s use of MacBench 5.0, the latest benchmarking utility from the Ziff-Davis Benchmark Operation (ZDBOp). Like previous versions, MacBench 5.0 is a subsystem-level benchmark that measures the processor, floating-point, disk, graphics, video, and CD-ROM performance of a Mac OS system. All MacBench 5.0 scores are relative to those of a Power Mac G3/300, which is assigned a score of 1,000.

New features include an improved graphics-playback test that's so realistic, you'll think your system is running the actual applications. ZDBOp also profiled new apps to make the tests as relevant as possible. MacBench's tests are based on profiles of leading business and publishing applications.

You can download a copy of MacBench 5.0 from www.macbench.com. But to run all the graphics and CD-ROM tests, you'll need to order the full version of MacBench 5.0 on CD-ROM via www.zdbop.com/reqfrm.html.—SCOTT LANE

EDITORS' CHOICE

♦♦♦½ **APS Jaz 2GB Pro** It's got a solid case and a fan to keep your cartridges safe and cool. **Company:** APS Technologies (816/483-1600, www.apstech.com). **List price:** $400.

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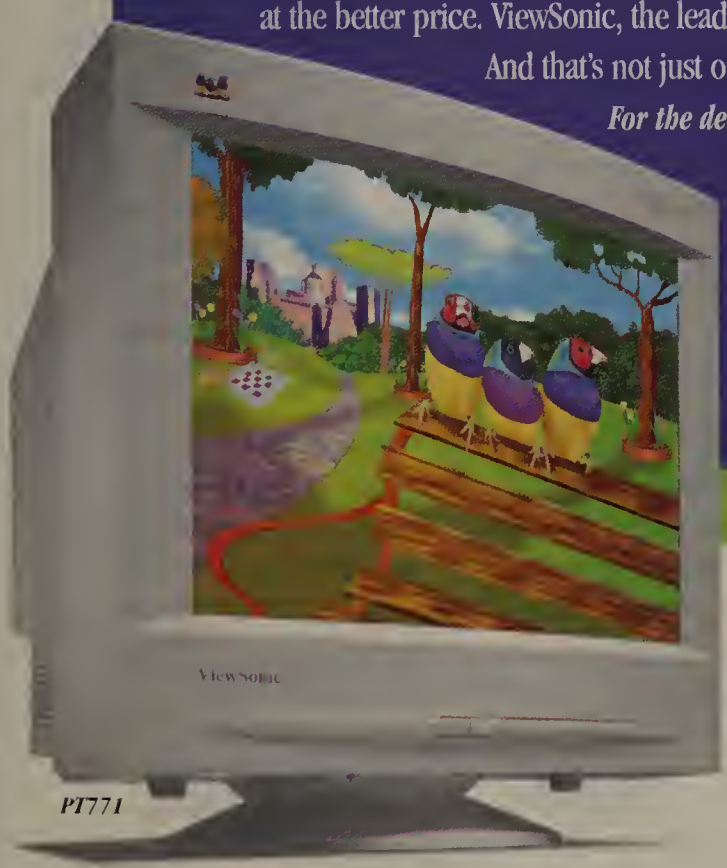

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DVD: Now Playing?

The Sequel to the CD-ROM Will Change the Face of Storage—but It's Not Here Quite Yet

While both use DVD formats, the Pioneer A02/U02 DVD-ROM drive (top) and Hitachi DVD-RAM Drive require different media.

PHOTOGRAPHS BY SCOTT PETERSON

by Cameron Crotty

DVD: It allows up to 17GB of data on a disc the size of an audio CD. It's positioned to replace VCRs in living rooms across the world. And it's destined to revolutionize the way you save and play back data on your Mac—well, maybe.

DVD stands for digital versatile disc or digital video disc, depending on whom you ask, and is poised to be the next knight in shining armor of optical storage. The discs boast enough space for full-length movies (complete with extra language tracks and directors' cuts), not to mention software titles with multimedia guaranteed to make your head swim. Down the line, writable DVD should offer easy, inexpensive storage for professional desktops as well as home machines.

But don't pitch your CD-ROM just yet. The DVD age isn't quite here. Problem one: Apple is just starting to deliver equipment for movie playback—custom G3 Macs with built-in DVD-ROM drives and kits for the latest G3 PowerBooks. Problem two: hardware manufacturers aren't exactly lining up to build DVD-ROM upgrade kits or external drives for the Macintosh. Problem three: you can count the number of shipping DVD-ROM titles on one hand, and movie studios are just beginning to release your favorites movies on DVD.

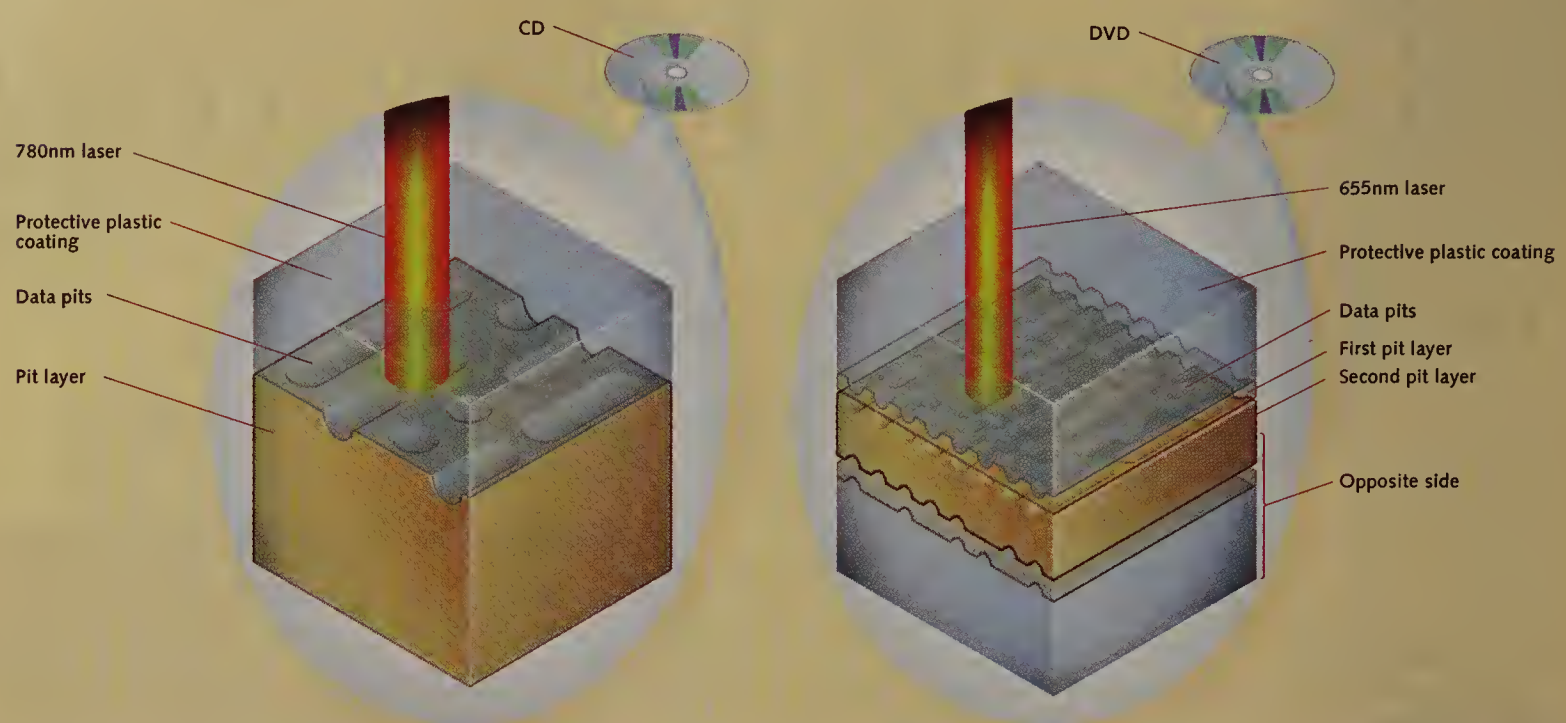
BIGGER, BADDER CD-ROM

Despite the current three-ring circus of hype, DVD is nothing but a more advanced version of CD-ROM optical-storage technology.

In fact, the method by which data is stored on DVD-ROMs is nearly identical to the one used by CDs: encoded digital information is pressed into a thin slice of

Pack It In

A double-sided DVD disc (right) holds 17GB of data, compared with a CD's 650MB (left), because it's actually two tightly packed, dual-layered discs glued back-to-back. A precise laser reads each layer of tightly packed pits, and translates them into the ones and zeroes that make up the digital information you see as movies or computer data. DVD discs must be turned over for the drive to read both sides.



aluminum, which is then sandwiched between layers of polycarbonate plastic for protection.

Also, DVD-ROM drives, like CD-ROM drives, spin the disc and bounce a laser beam off the aluminum layer. The encoded data is interpreted as binary bits (1s and 0s), resulting in a stream of data that your computer interprets as movies or multimedia.

Size Matters What makes DVD exciting are the volumes of data that can be packed on a single disc and played back at speeds of 18× to 20×. Thanks to higher-frequency lasers and better error-correction algorithms, DVD tracks and bits can be packed much more tightly than data on traditional compact discs—a simple, single-sided DVD disc can hold up to 4.7GB of data, whereas a CD gives you only 650MB.

That's just the beginning. Since DVD discs are also thinner than CDs, it's possible to glue two discs together back-to-back and bump up the total storage volume to 9.4GB. It's also possible to press a DVD disc with a second, semi-transparent data layer that floats above the base layer. You lose some capacity on the individual layers, ending up with a total of 8.5GB of storage space, but glue two dual-layer discs together and say hello to roughly 17GB of storage space. Not bad for a piece of media that's nearly indistinguishable from a mild-mannered compact disc (for a graphical explanation, see the diagram, "Pack It In").

GET YOUR DVD HERE

Getting DVD on your Macintosh is a two-step process—one step each to play software titles and movies. If all you want to do is play DVD-ROM titles, you can simply replace your CD-ROM drive with a DVD-ROM drive and its appropriate driver software. DVD-ROM drives use the familiar hardware buses—SCSI and IDE—already available on your Mac. (If you are an iMac owner, or plan to be, there are currently no manufacturers making DVD-ROM drives that use the Universal Serial Bus.)

Despite struggles over standards and an overwhelming lack of titles, a few brave manufacturers have stepped up to offer DVD products.

Macworld Lab tested three shipping DVD-ROM products: one external drive from Pioneer (www.pioneerusa.com) and two DVD-ROM upgrade kits from E4 (www.e4.com). All performed admirably in terms of output and ease of use. Review units of other shipping DVD products were not available at press time (see the table "What's Available Now").

Who's on First Feature films may be the draw for DVD today, but if you've been following along with your calculator, you know that the possibility of multigigabyte DVD-ROM discs is even more promising. But DVD-ROM software titles are scarcer than mice at a cat convention.

Don't despair, however, if you've already gone in for DVD or plan to. There will be a few game titles available by the end of the year, including Red Orb Entertainment's (www.redorb.com) Riven and The Journeyman Project 3: Legacy of Time, and Digital Leisure's (www.digitalleisure.com) Mac version of the arcade classic Dragon's Lair. Also, expect DVD-ROMs such as Wild Africa and Oceans of Life from Sumeria (www.sumeria.com) and the Better Homes and Gardens DVD Cookbook from Multimedia 2000 (www.m-2k.com).

THE FIRST PICTURE SHOW

If you're dreaming of DVD-based movies on your Mac, be warned: a DVD-ROM drive alone will not give you a theater-like experience. If it's Hollywood

ARNE HURTY

on your desktop you're after, you'll need some extra hardware.

With the proper software and built-in decoding hardware, your Macintosh can theoretically play movies directly from a DVD-ROM drive. But as a practical matter, DVD-Video (made up of a stream of MPEG-2 encoded video and an accompanying stream of digital audio) is just too fat for any desktop computer to handle without help. So the only way to play movies on your Mac is with an add-on card equipped to turn the flood of data into a special-effects–enhanced thriller.

You should also be aware that DVD movies may not be as attractive on your Mac's screen as on your television. Visual flaws, called *artifacts*, can occur when a film is converted to MPEG-2 format for use on DVD. Those artifacts are virtually invisible on a typical television, but they don't go unnoticed on a higher-resolution computer monitor.

FOR DVD DIEHARDS

DVD took its sweet time coming to the PC, and progress on the Macintosh side is lethargic at best. The $499 DVD-Video Kit for G3 PowerBooks is the only currently shipping product from Apple that includes both a DVD-ROM drive and a PC Card for decoding MPEG-2 video. On the desktop side, custom-built Power Mac G3's are available with both DVD-ROM drives and MPEG-2 decoding added to the systems' Personality Card. Apple says it has no plans to offer that DVD package as an upgrade kit or sell the card separately.

If you've already got a desktop Mac, E4 is your only choice for consumer-oriented DVD-ROM upgrades. When we reviewed the company's $429 CoolDVD first-generation package in the September 1998 issue, we found it a bit rough. Since then, the company has made several improvements.

The current incarnation of CoolDVD puts all components onto a single PCI card (instead of two), features a SCSI connection instead of ATAPI, and includes a better-shielded cable to improve picture quality. The latest version of CoolDVD also works in some older Macs—all you need for DVD-Video is a 120MHz PowerPC 603e processor or better, an open PCI slot, and the willingness to replace your existing CD-ROM drive. All versions of CoolDVD decode Dolby Digital audio for the latest surround-sound experience—Apple's products don't do this.

If you've already got a DVD-ROM drive and are looking to catch a flick or two, you'll have to look to E4 again—the company sells an MPEG-2 decoder PCI card separately for $229.

Can't wait to buy a G3 with built-in DVD? E4 offers upgrade kits with the digital-video and -audio connections you want.

THE GREAT WRITE HOPE

The ability to watch movies on your Mac and play gargantuan multimedia adventures without having to swap discs is not all that DVD offers.

The most exciting—and certainly the most practical—application of the technology is consumer drives that let you *write* to DVD. While we'd like to tell you that writing to DVD will be as easy as sticking a blank disc in a drive and dragging over some files, as you might do with a removable-cartridge drive (see the feature "Gigs to Go," elsewhere in this issue), it's just not true.

There are several different formats

What's Available Now

Company	Product	List Price	Phone	Description	Comments
Apple	DVD-ROM Drive	$80*	408/996-1010	DVD-ROM–drive option available with custom-ordered G3 Power Macs.	Currently offered only as an add-on feature, but soon it may come standard.
	DVD-ROM Expansion Bay Module	$400	408/996-1010	DVD-ROM–drive module for G3 PowerBooks.	Gives you DVD-ROM on your PowerBook—for when the titles start arriving.
	DVD-Video Kit	$499	408/996-1010	MPEG-2 PC Card plus DVD-ROM drive and DVD-player software for G3 PowerBooks.	The *only* way to watch movies you want on the plane. Software is the best we've seen.
E4	CoolDVD Mac DVD Playback Card	$229	408/441-6060	PCI MPEG-2 decoder card.	For the early adopters who already purchased a drive and now want to watch movies.
	CoolDVD Mac DVD-ROM Upgrade Kit	$429	408/441-6060	Upgrade kit for ATAPI includes DVD-ROM drive and PCI MPEG-2 decoder card.	This ATAPI version of the only DVD upgrade kit for the Mac is improved since our first review.
	CoolDVD Mac SCSI DVD-ROM Upgrade Kit	$99	408/441-6060	Upgrade kit for SCSI includes DVD-ROM drive and PCI MPEG-2 decoder card.	We liked the kit better in its SCSI incarnation. If you can handle the extra cost, go for it.
Hitachi	DVD-RAM Drive	NA	650/589-8300	DVD-RAM drive.	Evidence that DVD-RAM drives are coming for the Mac. We liked its easy-insert design.
Pioneer	DVD-A02/U02	$275	310/952-2111	DVD-ROM drive.	No custom-built G3 in your future? Add this SCSI DVD-ROM drive to your existing setup.

*NA = not applicable. * Price when purchased as an option for a custom-built G3 Power Mac.*

vying to be the standard for writable DVD on the Mac. The leading ones are DVD-R, DVD-R/W, and DVD-RAM.

DVD-R resembles CD-R (see "Burn, Baby, Burn," September 1998) in that they're both write-once technologies. Once you've created a DVD-R disc, you

The simulated remote control in Apple's DVD-player software is simple and efficient.

can't alter the content. This, coupled with its 3.95GB capacity and the naturally rugged nature of optical storage media, make it an ideal candidate for long-term data archiving. The downside is the cost of the drives—you can pick one up from Pioneer for around $17,000, with media available for about $40.

DVD-R/W is an extension of DVD-R and allows for larger-capacity (4.7GB), rewritable discs that can be recorded and erased 1,000 times. Expect to see drives between $3,000 and $5,000 when they become available in 1999. Also, unlike CD-RW, DVD-R/W will let you write and erase individual files, making it ideal for portable storage or as a hard-drive extension. The big advantage of both DVD-R and DVD-R/W discs is that both media types can be read by first-generation DVD-ROM players (see the table "The DVD Format War").

DVD-RAM discs, on the other hand, cannot be read with DVD-ROM drives now available—mostly because the media are so susceptible to contamination that they must be enclosed in a caddy that won't fit into a standard DVD-ROM or CD-ROM drive. DVD-RAM is a rewritable format—single-sided discs can hold 2.6GB of data and double-sided disks can hold 4.8GB. DVD-RAM drives can also read DVD-ROM discs and all the various CD formats.

Coming Recordables What will make DVD-RAM drives especially attractive, however, is their price. Hitachi (www.hitachi.com) is already making deals to supply its drives to other manufacturers to brand. We tested an early unit and found that with the right software, it works well as a backup device.

As we went to press, LaCie (www.lacie.com) was putting the finishing touches on an external SCSI DVD-RAM drive that will list for $799. And the company isn't alone—Affinity Technologies (www.ic-sol.com) and Maxoptix (www.maxoptix.com) are planning to ship drives by the end of the year.

THE LAST WORD

While CD-ROM for years fought an uphill battle to be accepted, DVD could very well replace CD-ROM in a flash. DVD-ROM drives are backward-compatible with CD-ROM discs, provide many times more capacity, and are based on technology we've already been using for years. DVD-RAM, furthermore, is set to bring inexpensive, rewritable optical storage to the masses.

Nevertheless, DVD is still in its infancy. Questions about which basic formats, especially for writable-DVD drives, will emerge as standards remain unresolved. The increased capacity of DVD-ROM offers a lot of potential, but right now most of the DVD titles for sale were recently playing at a theater near you.

DVD may be next year's hottest ticket, but right now it's just a promising coming attraction. **m**

CAMERON CROTTY is a San Francisco–based tech journalist who writes extensively on storage, systems, and games.

The DVD Format War

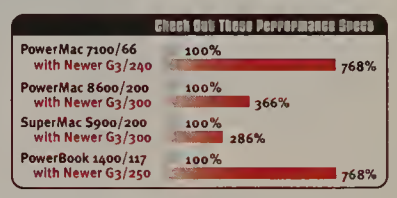
Nothing gets in the way of a new technology more than a standards battle. The same is true for DVD. While most of the issues around DVD-ROM are settled, more questions than answers remain about potential rewritable formats.

Format	Compatibility Issues	Capacity	Comments
DVD-Video	Works in consumer DVD-Video players and in DVD-ROM drives that have special cards for MPEG-2 decoding.	2 hours, 15 minutes of MPEG-2 video	Format used for high-quality MPEG-2 playback.
DVD-ROM	Second-generation DVD-ROM drives work with CD formats, but DVD-RAM media can't be read in existing DVD-ROM drives.	4.7GB per side	Few Mac titles available, but some are in development.
DVD-R	Drives read all CD formats, and media recorded in DVD-R can be read in DVD-ROM drives and DVD video players, but DVD-RAM and DVD+RW media are not compatible.	3.95GB per side	A write-once DVD storage format.
DVD-R/W	It is unclear whether R/W drives will read CD formats; media play in DVD-Video players and DVD-ROM drives but don't work with DVD-RAM or DVD+RW drives.	3.95GB per side	A rewritable format developed by Pioneer.
DVD-RAM	In its current state, DVD-RAM media can be read only by DVD-RAM drives, but drives can read all CD formats.	2.6GB per side	Proposed rewritable format backed by a majority of vendors.
DVD+RW	Media can be read by DVD-ROM drives, but DVD+RW drives cannot read DVD-RAM media; compatibility with CD and other rewritable-DVD formats is unclear.	3GB per side	Proposed rewritable format pushed by Sony and Philips.
MMVF	Too early in MMVF development to say what formats its drives and media will work with.	5.6GB per side	NEC's proposed DVD format; stands for Multimedia Video File.

"I'm sick of having to settle for a slower Mac just because my budget sucks."

Sometimes Newer Is Smarter Than New.

In a perfect world, we all would buy a new, top-of-the-line Mac right now. Of course, there's that little thing called money, the stuff most of us don't have coming out of our ears. That's why you need a Newer Technology MAXpowr G3 processor upgrade card. They're easy to install and save you thousands of dollars compared to buying a whole new system.



Newer Technology makes processor upgrade cards for almost every Power Mac and are adding more machines to the list with faster processor speeds as you read this. With a MAXpowr G3 card, you'll have a faster processor with a much faster cache. In fact, the MAXpowr G3 card can make your old Mac one of the fastest desktop computers available even compared to Apple's new screaming G3 machines. Thanks to Newer Technology, your older, slower Power Mac has new life which makes waiting for a brand new machine a lot less painful.

To find out how to make your old Mac newer visit www.newertech.com or call 1-316-943-0222
Choose 55 at www.macworld.com/getinfo

Every Mac User Is a Potential Victim of a Repetitive Injury. Protect Yourself with These Ergonomic Strategies.

Occupational Hazards

BY FRANKLIN N. TESSLER, M.D.

IT'S THE LITTLE THINGS THAT COUNT—even when it comes to computing. If you did 100 push-ups daily, you'd expect to feel the results. But what you may not realize is that using your Mac is also a workout.

During an eight-hour day at the keyboard, you repeat tiny motions thousands of times, whether it's clicking your mouse button or cocking your wrists left or right to reach for keys. You may not feel the cumulative results of these arm and hand gymnastics for months or decades—if ever. If you do, the pain may come on so gradually that you probably won't even associate it with using your Mac.

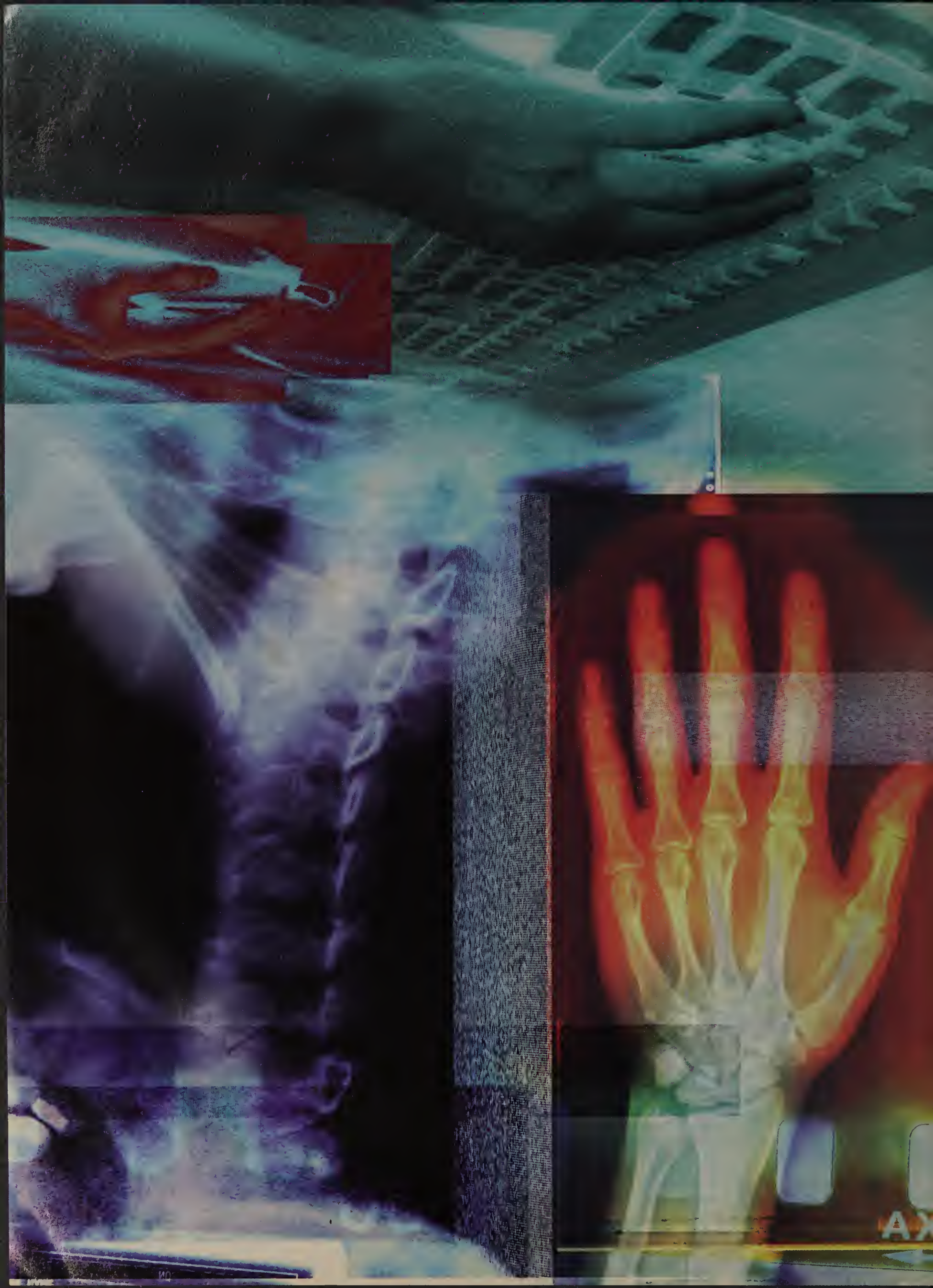
How can using a computer hurt you? For many years, experts have suspected that repeated, small motions can gradually cause harm, particularly when they're associated with unusual positions or tension. These injuries are called *repetitive strain injuries* (RSIs).

There's no consensus in the medical community that computer use leads to RSI—demonstrating a definitive cause-and-effect relationship in medicine is often difficult—but since the 1980s, the evidence has become too compelling for computer users (or government regulators) to ignore. Likewise, try as you might to ignore pain in your arms or hands, chances are it will only get worse unless you take steps to stop it.

The best medicine is prevention. Since my last article about computer-related health problems (see "Safer Computing," December 1994), many employers have, thankfully, become more knowledgeable about the dangers of RSI and are taking a more active role to prevent injuries by updating office equipment and training employees to work safely. (See the diagram "Create a Safer Workplace" for workstation setup tips.) As a result, the number of ergonomic solutions has skyrocketed.

With choices ranging from head-mounted pointing devices to wrist splints, you can end up looking more like a *Star Wars* storm trooper than a keyboard warrior, but you don't *have* to get lost in the avalanche of information. These guidelines will help you prevent injury and find quality help.

PHILIP KAAKE



STRATEGY 1

Improve Your Typing Technique

No computer component has received more attention, or criticism, from ergonomists than the keyboard. Regular keyboards typically encourage typists to twist and bend their hands in awkward positions, which can add up to serious wrist strain.

Know Your Enemy For starters, the flat layout of the keys—originally devised for mechanical typewriters—forces you to cock your hands sideways to reach the outer keys. This awkward position, called *ulnar deviation*, puts strain on the wrist and can cause problems. If the back of the keyboard has an upward tilt, it's also easy to bend your wrists sharply upward when you're typing—another contortion that can cause trouble. The feet at the back of many keyboards can compound the problem by increasing the angle of tilt (see the diagram "Wrist Twisters").

Function- and control-key combinations can also be potential wrist twisters, especially if you have small hands. Some common Macintosh ⌘-key combinations—⌘-Y, for example—force you to stretch your fingers unnaturally and painfully when you try to type both characters with the same hand (see the diagram "Stressful Contortion").

Take Matters in Hand Fortunately, there are simple steps you can take to lessen the risk of injury to your hands and wrists: keep your fingers relaxed and smoothly arched as you type, try not to bend your wrists (don't use your keyboard's extra feet, if possible), use two hands to enter awkward key combinations, and don't hit keys with too much force. It also helps to simply put your hands in your lap when you pause, instead of holding them motionless above the keyboard.

If you experience pain or tingling in your hands or wrists, however, it may be time to seek help and scrap your current keyboard altogether. (See the sidebar, "Helping Hands: When Work's a Pain.")

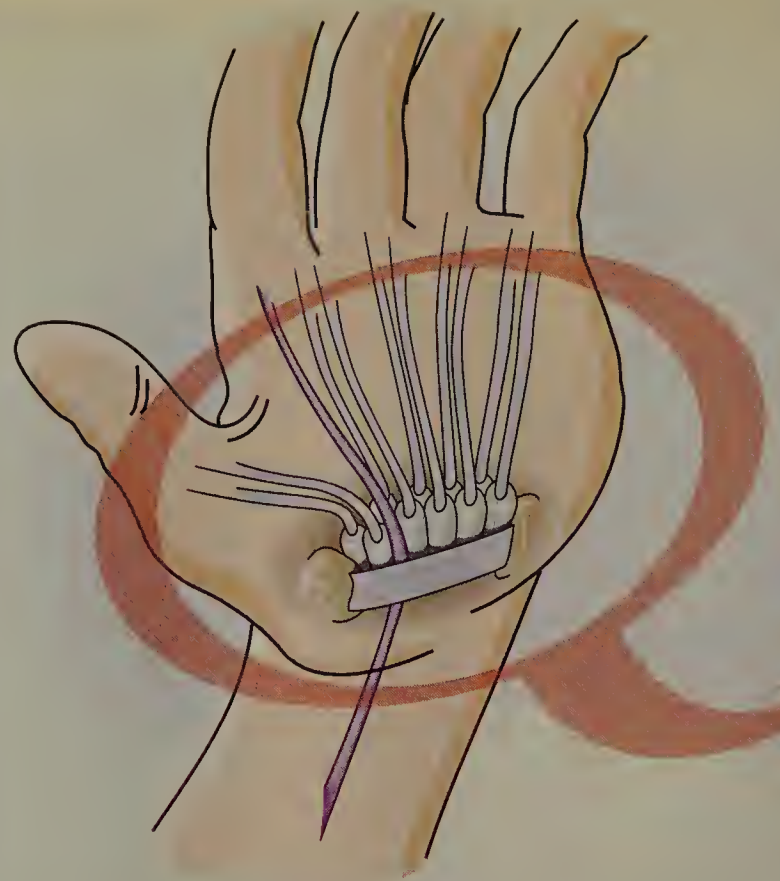
STRATEGY 2

Try an Alternative Keyboard

Several vendors offer alternative keyboards designed to remedy the ergonomic ills of conventional layouts.

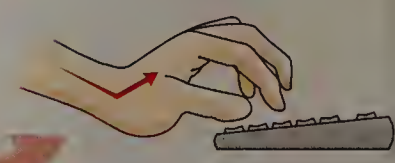
Go Natural Most vendors split the keyboard into halves that angle away from each other at the bottom. This lessens the degree of ulnar deviation, so your wrists assume a more neutral position. (To see what I mean, hold your hands with your palms facing down and angle your hands away from each other, bending them at the wrist. Now turn your hands so that your fingers and arms are in a straight line. Feel the difference?)

Other split keyboards have two sections that angle upward slightly in the middle. This also lets your forearms, wrists, and hands assume a more natural angle. The $70 Tru-Form, from Adesso (213/294-4300, www.adessoinc.com), is an inexpensive keyboard that combines both features, with the main keys separated into two groups that are angled away from each



Wrist Twisters

Bending the wrist can strain the carpal tunnel, through which tendons and nerves pass on their way to the hand. Try not to bend your wrist sharply (as seen below). Let your hands "float" above the keys.



HELPING HANDS: WHEN WORK'S A PAIN

PAIN IS BAD ENOUGH, BUT IF YOU'RE AN RSI SUFFERER, YOU'RE PROBABLY GOING TO HAVE TO DEAL WITH CONFUSION, TOO. AS SOON AS YOU BEGIN TO SEEK HELP, YOU WILL FACE A BEWILDERING RANGE OF CHOICES.

It's often difficult to know what to believe and what to ignore.

To help you work through the information maze (or better yet, educate yourself before you have a problem), I've assembled some pointers that will let you take advantage of all the resources at your disposal, from health-care providers to your bookstore to the Internet.

Health-Care Professionals The first place most people turn for help when they suspect they may have a computer-related injury is to doctors and other health-care pros. How do you know if your problem is serious enough to warrant their advice? Listen to your body, and get to know what's "normal" for you. Be suspicious if you feel pain, numbness, tingling, unusual hot or cold sensations (especially in your hands or arms), or loss of strength or dexterity. This goes double if your symptoms start—or get worse—when you're working at your Mac. Treat anything new as a warning sign. It's *never* a good idea to try to "live with" your pain. Remember, small things add up—over time, a minor injury may turn into a major one.

Unfortunately, finding a knowledgeable practitioner can be a challenge. Despite the rise in public awareness, most physicians still don't receive much training in how to diagnose or treat RSI. Complicating matters even further, RSI-related symptoms don't fall within the realm of any single health-care specialty.

No matter whom you consult, ask about their credentials, especially their training and experience dealing with RSI. Check out their references, and make sure that all your treatment options are explained to you in detail. If they balk at your questions, don't hesitate to look for help elsewhere.

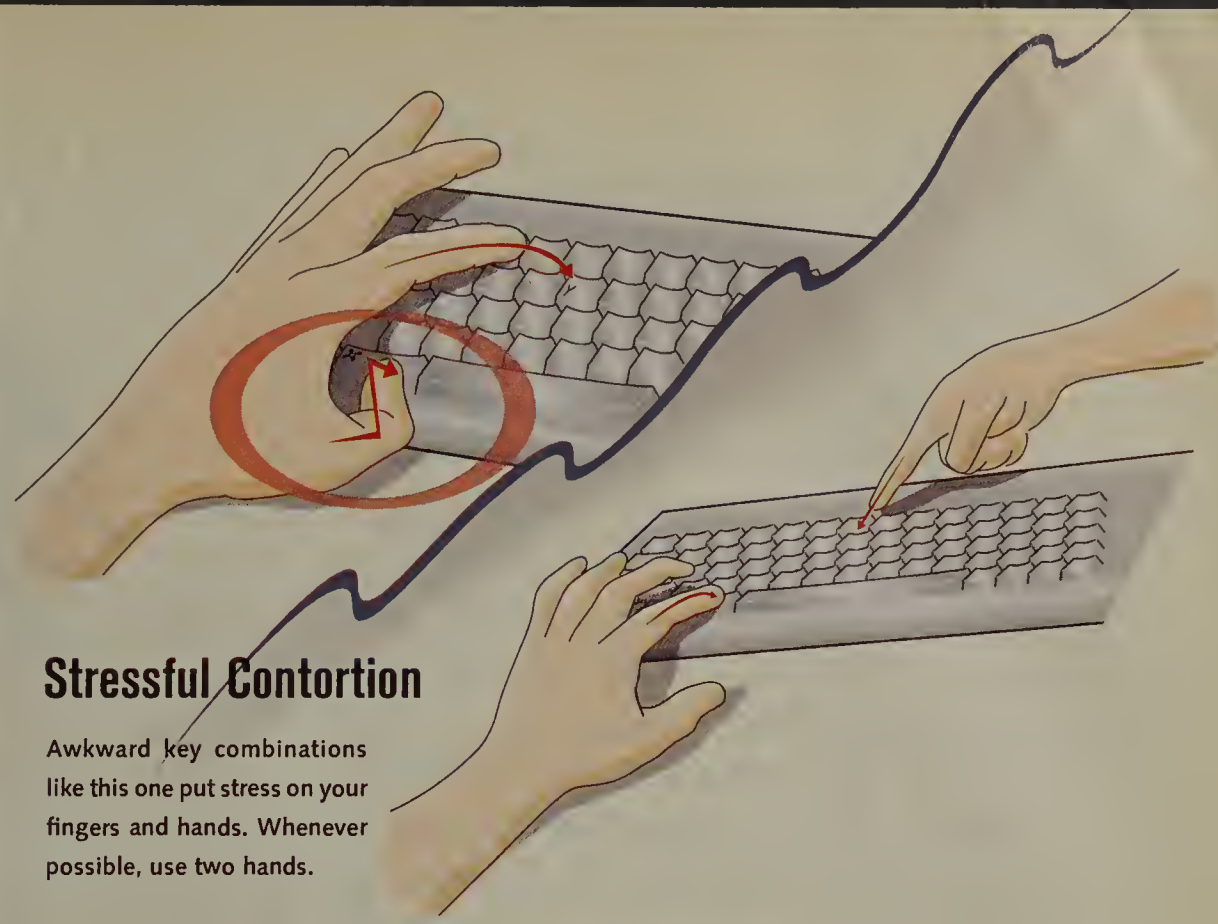
Self-Help Books Knowledge is power, especially when it comes to complicated injuries like RSI. Besides being great sources of tips and support, books can also help you learn what questions to ask your health practitioner. Here is a sampling.

other at the bottom as well as tilted upward at the center (see the photo "A New Angle").

More-expensive keyboards, such as the $259 Maxim, from Kinesis (425/402-8100, www.kinesis-ergo.com), let you adjust the split angle and the degree of central tilt to suit your body. The Maxim is also available *without* a built-in numeric keypad, handy if you rarely need to input numbers and dislike stretching just to use your mouse. You also may want to try Source 1 Ergonomics' Mouse Bridge ($16 to $29; 408/654-7960, www.source1ergo.com); it fits over the keypad and provides a platform for your mouse.

Consider Exotic Options As you continue up the price scale, the options become even more exotic. For example, the $199 Bat Personal Keyboard, from Infogrip (805/652-0770, www.infogrip.com), uses only seven keys—you enter characters by pressing keys in combinations called *chords*. The most expensive solution doesn't have keys at all: DataHand's (602/233-6000, www.datahand.com) eponymous system consists of two sculpted handrests with small holes for your fingers (see the photo "Keyboard Begone?"). The DataHand Personal Edition costs $995; a Mac adapter is $188 extra.

Proceed with Caution Before you reach for your checkbook, be aware that no alternative keyboard—no matter how radical—is guaranteed to prevent or lessen RSI. If you're already experiencing symptoms, seek professional advice before you change your keyboard or pointing device—"Helping Hands: When Work's a Pain" gives tips on what symptoms to watch out for. Also, you won't be able to tell if a particular device is right for you until you try it for at least a week or two. Make sure that anything you buy comes with an unconditional money-back guarantee.



Stressful Contortion

Awkward key combinations like this one put stress on your fingers and hands. Whenever possible, use two hands.

ILLUSTRATIONS BY ARNE HURTY

STRATEGY 3

Relax Your Wrists

When you're working at your Mac, it's important to keep your wrists as relaxed as possible. Remember: the nerves and tendons that control your fingers must pass through those narrow tunnels.

Rest, Don't Lean Many people have turned to padded rests to cushion and support their wrists. Most sit between you and the keyboard, but newer pads can fit in front of a mouse or trackball as well. Resting your wrist on a padded surface is a big improvement over placing it on the hard edge of your desk in a bent position. But using a pad regularly while you're typing can actually *increase* the risk of RSI. Why? Padded surface or not, if you lean on your wrist, you put pressure on it. Ergonomics experts suggest letting your hands and wrists "float" above the keyboard as you type.

Avoid Unsupervised Splints Wrist splints are also popular over-the-counter products for dealing with sore hands and wrists, but these, too, should be used with caution. Splints help support the wrist and keep it from bending. That's good, but keep in mind that if the splint is poorly designed or too tight, it can put *more* strain

Repetitive Strain Injury: A Computer User's Guide, by Emil Pascarelli, M.D., and Deborah Quilter (John Wiley & Sons, 1994; $16.95), is an excellent review of RSI and how to prevent it.

The Repetitive Strain Injury Recovery Book, by Deborah Quilter and Robert E. Markison, M.D. (Walker and Company, 1998; $15), explores the physical and psychological ramifications of RSI and offers recovery tips.

Carpal Tunnel Syndrome and Repetitive Stress Injuries: The Comprehensive Guide to Prevention, Treatment and Recovery, by Tammy Crouch (North Atlantic Books, 1996; $14.95), takes a practical approach to RSI and offers advice about how to find a health professional.

Internet Mailing Lists Perhaps ironically, the computer that can hurt you can help you, too—you'll find a valuable source of information and support online. The Sorehand mailing list, based in San Francisco, is an online self-help group where you can ask questions and exchange information with RSI sufferers. If you're lucky, you may even read about a support group that meets in your area. To subscribe, send e-mail to listserv@itssrv1.ucsf.edu with "subscribe sorehand *your address*" in the body of the message.

Legal Aid The law is usually the last resort for people who feel they've been injured in the workplace or who are concerned that their needs aren't being met. However, don't be afraid to seek legal advice if you suspect you've been injured on the job. To find a lawyer who specializes in workers' compensation claims, consult your local bar association or get a personal recommendation. Several Web sites also can help you.

Web Aid

Typing Injury FAQ: A wide variety of information about RSI
www.tifaq.com

West's Legal Directory: Help in finding an attorney
www.wld.com

National Institute for Occupational Safety and Health home page
www.cdc.gov/niosh/homepage.html

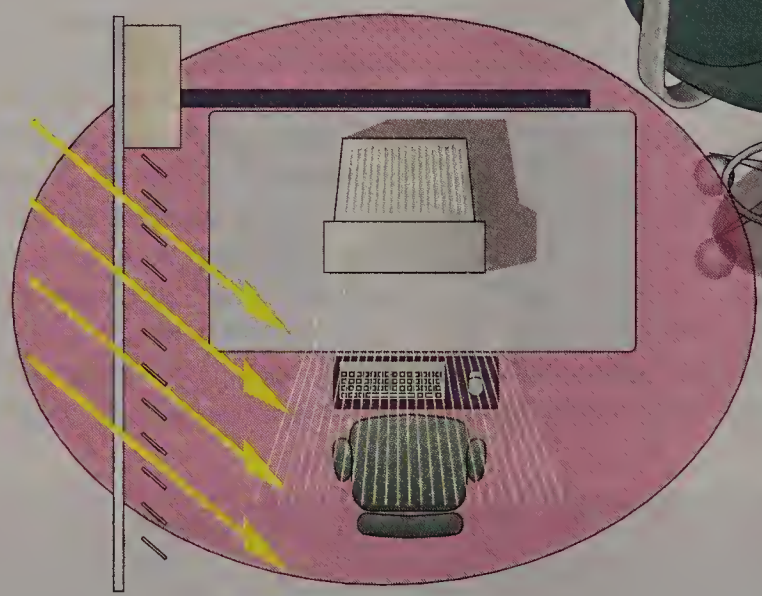
Occupational Safety and Health Administration home page
www.osha.gov

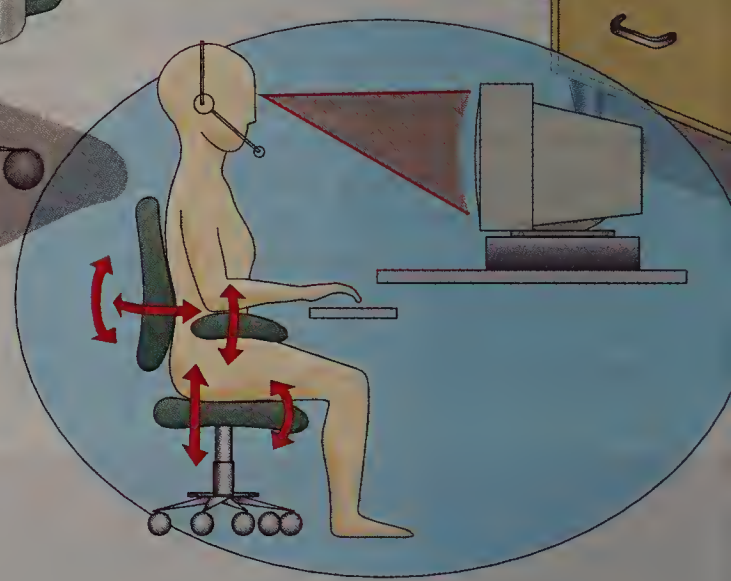
List of physicians who specialize in treating RSI, recommended by patients
www.engr.uni.edu/ee/eeshop/findadoc.html

Create a Safer Workplace

Whether you're setting up an office from scratch or redesigning an existing work area, it's important to pay attention to all the elements of your environment. Happily, you don't have to spend a fortune to set things up ergonomically—sometimes, simply rearranging existing furniture and equipment is enough. These tips can help you start to make your workspace a healthy place.

If you're an employer with more than a handful of employees to take care of, you also may want to hire an ergonomics consultant. It's important to make sure you satisfy any state or local regulations in your jurisdiction. A call to your state or local occupational-health office is a good place to begin.





Proper Lighting

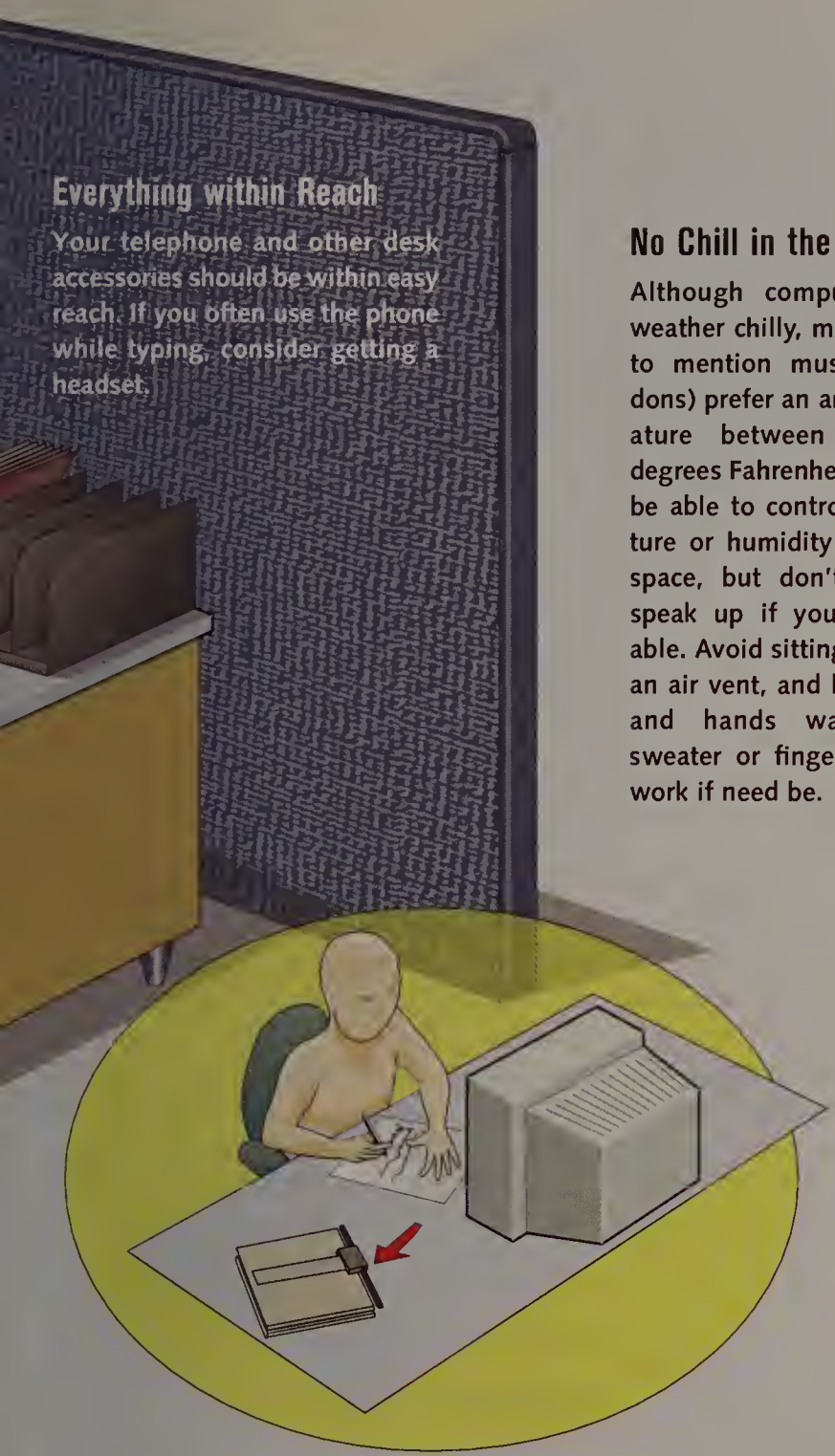
The light at your workspace shouldn't overwhelm your monitor. If you're lucky enough to sit near a window, control the amount of outside light with louvered blinds. Monitor glare can contribute to eyestrain and headaches, so avoid placing bright lights behind you. Antiglare filters can help, but they also cut down on the screen's brightness. (A glare hood—like those traditionally used by prepress pros—is another option if you pick up glare from the side.)

A Comfortable Chair

Posture is key when you're working at your Mac—if you slouch while typing, you put pressure on the wrong parts of your body, and this can contribute to strain in your back, neck, or arms. Make sure your chair helps you to sit up straight. It should also support your thighs; adjust the height so that your feet rest flat on the floor. Armrests should be adjustable, too, although some experts caution against using them at all while typing.

A Well-Placed Monitor

Place your monitor at least 16 inches away from your face, but not so far that you have to squint. If you have difficulty reading text, try switching your monitor to a lower resolution (which will increase the size of everything on screen). If that doesn't help, consider having your vision checked. The top of your monitor should be at or slightly below eye level—you don't want to have to tilt your chin up to look at the screen.



Everything within Reach

Your telephone and other desk accessories should be within easy reach. If you often use the phone while typing, consider getting a headset.

No Chill in the Air

Although computers like the weather chilly, most people (not to mention muscles and tendons) prefer an ambient temperature between 65 and 70 degrees Fahrenheit. You may not be able to control the temperature or humidity in your workspace, but don't be afraid to speak up if you're uncomfortable. Avoid sitting directly under an air vent, and keep your arms and hands warm. Wear a sweater or fingerless gloves at work if need be.

Space to Write

Make sure that you can free up desk space in front of you for writing, or use an L-shaped desk with a writing area on the side. Otherwise, you may find yourself twisting into awkward positions just to jot down a note. If you use a keyboard tray, it should be large enough to accommodate your keyboard and pointing device.

ILLUSTRATION BY ARNE HURTY

on the wrist and make matters worse. Never use a wrist splint without having first consulted a medical professional.

STRATEGY 4

Choose a Pointing Device That Fits

The keyboard has gotten a lot of attention for its ergonomic role, but you should take a look at your pointing device as well.

Most Macintosh users opt for a mouse or trackball—the choice is largely a matter of personal preference. Vendor claims notwithstanding, there's no convincing evidence that either one is safer than the other, but you can take steps to use what you have more safely.

Relax Your Grip If you use a mouse, avoid gripping it too tightly, which can fatigue the muscles in your hand. If the cursor doesn't respond smoothly, pop the mouse open and clean the ball and rollers according to the manufacturer's instructions. Replace the entire device if you must.

Find Your Size Also make sure your pointing device fits your hand. The mouse or trackball should fit comfortably into your cupped palm, and you should not have to stretch or contort your fingers to reach the buttons or move the ball. The buttons should be easy to press, and the ball should roll smoothly.

Trackballs come in a variety of shapes and sizes, so you should be able to find one that fits. Most mouse vendors take the one-size-fits-all approach, but Contour Design (603/893-4556, www.contourdes.com) sells a three-button mouse—including two left-handed models—in five sizes. Prices vary from $90 to $100.

Ditch Your Mouse If you can't use a mouse or trackball without experiencing pain or other symptoms in your hands, wrist, or elbow, you can turn to a variety of other pointing devices, ranging from writing tablets the size of a mouse pad, such as the $140 Art Pad II, from Wacom (360/896-9833, www.wacom.com), to touchpads built into keyboards, such as Adesso's $80 Nu-Form with Touchpad.

There are also alternatives if you simply can't tolerate a hand-operated pointing device. The $295 NoHands Mouse, from Hunter Digital (310/476-1874, www.hunterdigital.com), consists of two pedals you operate with your feet. If that won't work, the $1,995 HeadMouse, from Origin Instruments (972/606-8740, www.orin.com/access), lets you control the cursor by moving your head. A compact box sits on top

A New Angle The $70 Tru-Form keyboard from Adesso is split and angled to encourage you to hold your hands more naturally. Other, more expensive keyboards come split into two parts so you can find the angle that suits you best.

ARNOLD TIOSEJO

Keyboard Begone? The DataHand (top) and Infogrip's Bat Personal Keyboard offer a completely different approach to data entry. But make sure there's a money-back guarantee before you buy anything exotic.

of your monitor and reads the position of a reflective dot that you attach to your forehead or eyeglasses.

STRATEGY 5

Make Your Software Do the Work

If repetitive typing and pointing can cause RSI, it stands to reason that the more you do to keep your hands away from your keyboard or pointing device, the better off you'll be. Short of quitting your job and becoming a radio voice-over specialist, one of the simplest ways to save keystrokes and mouse-clicks is to use keyboard shortcuts.

Quit Clicking You're probably already familiar with keyboard equivalents for common menu items, such as ⌘-S for Save and ⌘-Q for Quit, but most Mac applications offer many additional shortcuts; the best way to find out what's available is to check the manual. Some programs, such as Microsoft Word, let you customize keyboard shortcuts. And if you want to create shortcuts to automate really complex tasks, one of the best commercial products is the $119 QuicKeys, from CE Software (515/221-1801, www.cesoft.com).

It's also a good idea to explore the software that ships with your pointing device. For example, some multiple-button mice and trackballs let you reduce wear and tear on your hands by setting a button to double-click with only one press of your finger. (Remember: every little bit counts.)

Some pointing-device software lets you enter paragraphs of boilerplate text, such as letter templates or frequently used addresses, with a single mouse-click. You can also lessen the strain on your fingers by using the sticky-menus feature in Mac OS 8 and later, which saves you from having to hold down the mouse button.

Speak Up If you really want to minimize use of your hands, use your voice instead. If you have a Power Mac running System 7.5 or higher, you can try Apple's PlainTalk software, which is available from Apple's PlainTalk Web site (http://speech.apple.com). The software, which also requires a PlainTalk-compatible microphone, lets you control tasks such as launching applications and emptying the Trash by speaking commands.

Unfortunately, the Macintosh has fallen behind Windows PCs when it comes to more-advanced voice-recognition options; currently there are no Mac OS–compatible products that let you dictate using natural speech. Dragon Systems' $395 Power Secretary (617/965-5200, www.dragonsystems.com) does let you dictate to your Mac at up to about 50 words per minute, but you have to pause slightly between words. (For more on Mac voice recognition, see *The Desktop Critic*, in this issue.) Keep in mind that even voice control is no panacea: some users report hoarseness after prolonged use. You can overdo just about anything.

STRATEGY 6

Take Breaks

Tension is the bane of people who are trying to avoid RSI. It stiffens muscles and locks posture—and makes you forget all these tips. According to some research, state of mind plays an important role in the *development* of many health problems, including RSI.

Stand Up and Stretch There's no magic formula that guarantees job satisfaction, but one of the best ways to ward off stress is to take frequent short breaks from your work: stand up, stretch, and walk around a few times every hour. If you become too absorbed in your work to remember to relax, try setting a timer.

Let Your Mac Help You can also buy software to remind you to relax. The $25 ErgoMinder, from Sapiens Software (www.vision.net.au/~macsol/ergo.htm), pops up a reminder window that illustrates one of several relaxing exercises. Coffee Break, a $5 shareware program by Thomas Reed, forces you to take breaks at regular intervals; you can get it from the Macdownload Web site (www.macdownload.com). Finally, MouseWorks, the clever software that ships with Kensington Technology Group's line of pointing devices (650/572-2700, www.kensington.com), actually monitors just how long you've been *using* your keyboard and pointing device and displays periodic rest reminders based on this information.

The Last Word

If you use your Mac only to balance your checkbook or write an occasional letter, your chances of experiencing RSI symptoms are—blissfully—low. On the other hand, if you rely on it to do work day in and day out (and play games after hours), then the possibility of developing potentially debilitating RSI will always be with you.

Pay attention to basic safety when using your Mac, just as you would when doing any activity. The strategies outlined here will get you off to a good start. Even if your risk of injury is small, the rewards of staying pain-free and protecting your livelihood are too great to pass up. **m**

FRANKLIN N. TESSLER, M.D., is a radiologist and *Macworld* contributing editor who has written about computer ergonomics since 1991.

Storage for the Masses

Compact Disc is the standard media of the business desktop with over 300 million CD-ROM drives in homes and offices worldwide. Now, Yamaha makes CD's mass appeal even more appealing to business — by making CDs ReWritable. Yamaha CD ReWritable drives give you the capacity to record up to 650Mb of video, audio or data on a single CD-RW disc — and the flexibility to erase and rewrite any part of the disc for revisions and backups. The same CD-RW drive also records CD-R write-once discs that every CD-ROM drive can read. It speed-reads all standard CD formats. And it performs like a Yamaha—the standard of quality in CD recording accuracy and reliability. Let Yamaha CD-RW drives be your business standard. Visit our Web site for a dealer near you.

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SAN FRANCISCO

THE FUTURE HERE AND NOW

JANUARY 4-8, 1999

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FOR A FULL EXHIBITOR LIST, UP-TO-THE MINUTE INFORMATION, OR TO REGISTER, CALL (800) 645-EXPO OR VISIT: **www.macworldexpo.com**

You've seen the reports from Silicon Valley to Wall Street—with increasing support from developers, vendors, and committed third parties.

For millions of computer users, Macintosh is synonymous with increased productivity and innovative technology advances. Come to San Francisco—home to a "think different" community—for the latest technologies and trends that will change the way you work, play, and learn now, and in the future.

At MACWORLD Expo/San Francisco, you'll demo, touch, see, and feel all the hot new products from over 400 leading vendors. Buy right on the show floor and enjoy show specials! Products and services centered around the iMac, PowerBook G3's, PowerMac G3 Desktops, QuickTime™ and much more! Learn time-saving productivity secrets through in-depth workshops and advanced and user-level conference programs. Hear from the brightest stars who are reshaping the future of the Mac universe at the much-anticipated keynote address.

YOU ARE INVITED TO ATTEND THE PREMIER EVENT FOR:

- *the Internet*
- *digital content creation, management, and delivery*
- *multimedia*
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- *publishing*
- *education, research, and development*
- *home computing*
- *gaming*
- *entertainment*
- *new media professionals*

In today's fast changing "wired world," it's a fact of life — Macintosh users lead the way into the creative markets, schools and the home while the others follow. Come to MACWORLD Expo/San Francisco to see what technologies, strategies and solutions the rest of the world will soon be using.

MACWORLD Expo/San Francisco is the largest Mac-focused event where you can see all the industry's leading vendors and latest innovations. There is no better opportunity to see, hear and learn so many ways to improve your productivity, business results and home computing experience. Look at all you can do at MACWORLD Expo/San Francisco:

- *The Mac OS is back! See the growing list of vendors supporting the industry's hottest new products and technologies. See, feel, and demo the latest products so you can make informed purchasing decisions about your Mac investments.*
- *With the successful introduction of the iMac and PowerMac G3's, new products are coming to the market at an unprecedented pace. Buy these products right on the show floor—at a discounted price!*
- *Enhance and update your creative skills, concepts and strategies by attending any of the dozens of conferences and workshops developed specifically for the individual needs of both Mac professionals and consumers. Grow your business and enhance your Mac experience!*
- *Hear the very latest news and industry buzz before it hits the streets by attending our keynote sessions and conferences.*
- *Network with other Mac professionals to share ideas and insights on getting the most from the iMac and other high-performance G3 products.*

- **TOWN MEETING:** January 4, 1999
- **PRE-CONFERENCE WORKSHOPS:** January 4, 1999
- **KEYNOTE ADDRESS:** January 5, 1999
- **EXHIBITS:** January 5-8, 1999
- **Macworld/Pro CONFERENCE:** January 5-7, 1999
- **MACWORLD EXPO USERS CONFERENCE:** January 6-8, 1999

REGISTER BY DECEMBER 4 AND SAVE!

SAVE $100 ON PACKAGE 1:
Full Package (ALL Macworld/Pro and MACWORLD Expo Users Conference Sessions)

SAVE $100 ON PACKAGE 2:
Pre-Conference Workshop & All Macworld/Pro Conference Sessions

SAVE $100 ON PACKAGE 3:
All Macworld/Pro Conference Sessions

SAVE $50 ON PACKAGE 4:
MACWORLD Expo Users Conference Sessions & Pre-Conference Workshop

SAVE $25 ON PACKAGE 5:
All MACWORLD Expo Users Conference Sessions

SAVE $50 ON PACKAGE 6:
Pre-Conference Workshop

SAVE $16 ON PACKAGE 7:
MACWORLD Expo Exhibits

All packages include admission to the exhibit floor. Please refer to the registration page for complete package descriptions.

TAKE ADVANTAGE OF THESE SAVINGS!

COMPLETE AND RETURN THE REGISTRATION FORM TODAY!

Or go to: www.macworldexpo.com to register.

more ►

Industry Leaders Speak Out!

KEYNOTE ADDRESS:

The Macintosh industry is one of the most exciting and fast-moving places to be these days. What are the trends that will shape the industry in the year ahead? What are the technologies to keep an eye on? Hear the insights and predictions of the people who are moving the industry forward at the MACWORLD Expo keynote address. MACWORLD Expo is traditionally the place where the news is made—don't miss this opportunity to hear it first!

Tuesday, January 5, 9:00 a.m. - 10:00 a.m. *at the Marriott Hotel*

TOWN MEETING:

MACWORLD Expo Conference attendees are invited to attend this opening session of MACWORLD Expo/San Francisco. Hosted by conference chairperson Paul Kent and Mac industry stalwart Bob LeVitus; come and hear experts from all corners of the Mac community speak on a variety of subjects. The MACWORLD Expo Town Meeting features lectures, debates, performance, cool demos and interactive discussions.

Monday, January 4, 9:00 a.m. - 11:30 a.m.

Special Interest Environments

ON THE MACWORLD EXPO EXHIBIT FLOOR **January 5-8, 1999**

EDUCATION DISTRICT

The newly expanded Education District will showcase software, Internet tools, curriculum building solutions and multimedia for schools, training and home learning. Bursting with new applications, hardware, and real-world solutions from leading developers and solutions providers, the Education District will bring you new ways to enhance classroom learning.

APPLE DEVELOPER CENTRAL

Come see the latest applications, custom solutions, multimedia, scientific and engineering solutions for the Macintosh. Annually Developer Central is one of the very best resource centers where software developers can find the tools and solutions they need to grow their companies and reduce development time and costs.

CONSUMER APPLICATIONS AT HOME

Consumer Applications at Home will be the premier showcase for digital entertainment and consumer applications created for home use. Supported by Apple Computer, this exciting area will deliver hands-on demonstrations, solutions, and real-life business models for consumer applications, appliances and entertainment content.

EXTENSIONS WORKSHOP FOR CREATIVE CONTENT

The Extensions Workshop is the showcase for the most popular desktop publishing, multimedia and pre-press applications. Its bound to be a major attraction at MACWORLD Expo! Join the World-Wide Power Company and XChange NA in demonstrating and reviewing cutting-edge extensions designed to help you create and publish compelling content.

MACINTOSH GAMING CHAMPIONSHIP & EXHIBITIONS

Showcasing the latest gaming titles and environments for the iMac and other Mac products, the Macintosh Gaming Exhibitions is a high-energy interactive area to get your hands-on today's hottest games. Featuring the ultra-successful National Macintosh Gaming Championship and retail store, you will have the opportunity to demonstrate, compete, and buy the latest Mac game titles.

*Check out **www.macworldexpo.com** regularly for updates and announcements about other new special attractions on the MACWORLD Expo show floor, including areas dedicated to QuickTime™, Internet server and application development tools, video streaming and content asset management.*

PRE-CONFERENCE WORKSHOPS

Monday, January 4, 1999:
12:00 p.m. – 7:00 p.m.

Make the most of your time at MACWORLD Expo/San Francisco. Take advantage of this unique opportunity to spend an entire day getting in-depth training before the conferences and exhibits begin. Full workshop session descriptions are posted on the Web at: www.macworldexpo.com.

- **[WA]** Practical Introduction to Mac Networking
- **[WB]** Designing Web Pages with Dynamic HTML
- **[WC]** Desktop Publishing: The Big Picture
- **[WD]** Creation of High Quality Photographic Web Content
- **[WE]** Essentials of Web Publishing
- **[WF]** Putting Internet Commerce to Work
- **[WG]** Optimizing AppleShare IP in the Integrated Network Environment
- **[WH]** Macintosh Network Administration with the Apple Network Administrators Toolkit
- **[WI]** Introduction to Content Asset Management
- **[WJ]** Workflow Automation with AppleScript

THE CONFERENCE PROGRAM

Macworld/Pro Conference • MACWORLD Expo Users Conference

Macworld/Pro

The Technical Conference for Macintosh Professionals

January 5 - 7, 1999

Get in-depth, advanced technical training at MACWORLD Expo by participating in the Macworld/Pro Conference. Improve your skills, meet other Mac professionals with similar challenges and stay on top of your profession. The Macworld/Pro Conference is designed for:

- Webmasters, Content Creators, Web Entrepreneurs, Web Developers
- Network Managers, Network Administrators
- Support Professionals
- Developers
- Mac Platform Managers from Business, Government and Education
- IS/IT/MIS Managers
- Educators

Participate in these sessions led by a faculty of world-class instructors and lecturers and take your computing efforts to the next level. You'll emerge from this conference with enhanced skills and a wealth of new information. Here's what you can expect.

Macintosh Networking & Communications

This track presents techniques and technologies associated with deploying Macintosh LANs, WANs, Internet/Intranets and remote access. These technical sessions take you inside the protocols and services you will encounter when using Macs on a network.

Sessions Include:

- Open Transport Update – the Macs on TCP/IP Report
- Tuning Open Transport
- On the Trail of Network Problems
- High Speed Connection Alternatives – Which is Best for You?
- Building a Mac-Centric Intranet

... and more

Creative Track 1

This track hosts several theme days of education for creative professionals. "PDF Day" goes inside the world of the Portable Document Format and reveals how you can mass distribute documents to users and ensure consistent viewability. "Managing New Media Businesses Day" offers sage advice and practical tips for competing in the hot new media creative world. "Publishing Automation Day" offers 3 solution filled sessions for optimizing publishing workflow processes to save you time and money.

Sessions Include:

- Introduction to PDF
- PDF in the Real World
- Color Management: Digital Proofing
- Pub Auto: Working in RGB
- Pub Auto: Taking Content In-House

... and more!

Creative Track 2

The second Creative Track features full days of courses for professional Webmasters, Digital Video and Broadcast pros, and some fascinating and informative sessions about Content Asset Management. Attend these sessions and you will go inside these hot areas and discover new means to enhance your skills.

Sessions Include:

- Web Day: Understanding and Applying XML
- Web Day: Top 20 Tips for Webmasters
- Video Day: Producing Interactive TV for WebTV
- Video Day: Production for Digital Broadcast
- Content Management: Web-Based Content Management

... and more!

Creative Track 3

Creative Track 3 offers a comprehensive curriculum of Color Management courses. Learn how to insure color from source through delivery in these hot, timely and cutting edge sessions. The track is rounded out with a series of practical sessions on Pre-Flighting, Web Audio and QuickTime™ that will provide excellent advice on these ground breaking technologies.

Sessions Include:

- Color Management: ColorSync Workflow
- Color Management: Deploying Color Servers
- Create Biz: Issues in Running a Web Design Agency
- Pre-flighting or How to Save $400 at the Service Bureau
- Delivering Audio on the WWW

... and more!

Managing the Mac Platform

The Macintosh continues to be a platform in transition. Environments that deploy Mac OS and related technologies are being forced to evolve along with the platform. It is now more critical than ever to approach Mac systems management methodically no matter what size your organization.

Sessions Include:

- Managing Your Hardware Assets
- Software License Compliance
- Backup Planning and Disaster Recovery
- Planning the Next Generation Mac
- Technical Overview of USB

... and more!

MACWORLD Expo Users Conference

January 6 - 8, 1999

Learn from the professionals about how to use your Mac at work, at home, at school and on the road by participating in this conference program.

Maxing Your Mac

Put your Macintosh in full throttle and squeeze every bit of performance out of it. Whether you're working with an old Mac or the latest fully loaded model, you'll get a lot of sound advice and useful tips from experts.

Sessions Include:

- Connect your New iMac to Your Old Stuff
- Fabulous Powerbook Speedups
- How to Get the Most from Your iMac
- Mysteries of the System Folder Revealed – Part I & II
- Troubleshooting - Unlikely Solutions

... and more!

The MACWORLD Expo Gallery

Creative people have always chosen the Macintosh as the best tool for turning their vision into reality. This track features renown artists from around the Mac community demonstrating their dazzling works and explaining how they used Mac-based tools to achieve their stunning success. See why the Macintosh is still the premiere environment for bringing creative ideas to life.

Sessions Include:

- 3D Techniques
- Making Beautiful Music: The Macintosh Musician
- Ho-Hum to WOW in 60 Seconds Flat
- How'd they do that (with Adobe Illustrator!)
- Creative Macintosh Layout Techniques

... and more!

Crash Courses

Need to get the scoop on the latest technology? Want to get up to speed with the hottest tools? Attend our Crash Courses for a quick hit of technology explanations to help make you a more informed Macintosh user.

Sessions Include:

- Getting Started with Digital Photography
- Getting Setup for the Internet
- Other Uses on the Mac
- Your First Web Page
- How the Internet Works

... and more!

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FOR A COMPLETE EXHIBITOR LIST, UP-TO-THE MINUTE INFORMATION,
OR TO REGISTER, CALL (800)645-EXPO
OR VISIT: www.macworldexpo.com

THE CONFERENCE PROGRAM

Macworld/Pro Conference • MACWORLD Expo Users Conference

Top Tools

Extend your mastery of a variety of Mac tools by attending these power-user sessions. Whether you're wondering how to get more out of the tools you use every day or learn what a new tool can do for you, these sessions will unlock the secrets of your favorite programs and get you up to speed quickly with advanced features you didn't know were available.

Sessions Include:
- Advanced Filemaker Techniques
- Just Flash It!
- Better HTML
- Hot Quark Tips and Tricks
- Digital Wizardry with Photoshop

... and more!

Apple Technology Tutorials

Inside your Macintosh are some of the most advanced and innovative system technologies available on any computer platform. Gain in-depth understanding of these technologies, learn why they're special.

Sessions Include:
- Introduction to QuickTime™ 3.0
- Understanding ColorSync
- Secrets of AppleScript Wizard
- Mac OS Update
- Setting Up a LAN with AppleShare IP

... and more!

Center Stage

We've invited some of the luminaries from the Mac community to share their visions, educate, entertain and enlighten you in these sessions. On Center Stage you'll gain new perspectives from some of the most progressive thinkers in our industry.

Sessions Include:
- How to Be a Mac Power User
- Renegade Publishing
- How to Ruin the Internet
- Delivering on the Promise of the Web: Making Everyone a Desktop Publisher

... and more!

Small Office/Home Office (SOHO)

It's never been easier or more fun to use Macintosh technology to launch and operate a small company, home-based business or to telecommute from your home office. Learn from experts how to put technology to work for you painlessly to create a lean, mean business machine.

Sessions Include:
- Putting Your Small Business on the Web
- Be a Mac Office—Even if Your Clients are on Windows!
- Telecommuting Essentials
- Small Business Intranet Instruction Kit: Part I and II
- Macintosh Telephony for Small Business

... and more!

For Educators Only

The Macintosh paradigm for computing ease-of-use has made it the platform of choice for educators world-wide. This track showcases innovative applications and techniques that can enhance both learning and teaching opportunities in your school.

Sessions Include:
- A Taste of Apple Staff Development
- Practical uses of QuickTime™ in Education

... and more!

Macworld Magazine Presents

Macworld's editors, columnists and featured guest speakers present the hottest topics straight off the pages of the industry's premier publication.

Sessions Include:
- *Macworld* Magazine's Presents Vision Thing Live
- *Macworld* Magazine's Presents Newsmakers... A Candid Discussion
- *Macworld* Magazine's Best of Show
- Ask the Experts
- The Game Hall of Fame
- The Best of *Macworld* Magazine's Mac Secrets

... and more!

Goodies

These light-hearted sessions are just for fun! Come join fellow members of the Macintosh user community as we celebrate technology in this wild, weird and wonderful track.

Sessions Include:
- Better Living Through Home Electronics – Gadgets
- Palm Pilot & Macintosh – A Match Synched in Heaven
- The Game Gurus
- Home Networking for the Two Computer Family
- Sports on the Internet

... and more!

Travel Made Easy & Convenient!

Travel to MACWORLD Expo/San Francisco Made Easy and Convenient!

Early booking is strongly advised to ensure best hotel selection. Hotel reservations will be assigned on a first-come first-served basis based on availability. Rates shown are per night, per room, and do not include room tax, currently 14% San Francisco occupancy tax. After December 1, 1998 the convention rate may not apply.

Air Reservations: Exclusive discounted fares are available to San Francisco, San Jose and Oakland airports via United Airlines and Delta. A MACWORLD Expo travel professional can assist you with access to these fares or you may contact the airlines directly utilizing the MACWORLD Expo discount numbers below. Additionally, your travel agent may utilize these discount numbers and receive the same low fares.

UNITED: (800) 521-4041 #525XR
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Fax: (408) 918-4250
Email: macworld@chmrooms.com.

MACWORLD EXPO / SAN FRANCISCO ADVANCE REGISTRATION FORM

1. REGISTRATION SELECTION AND FEES (SELECT ONE ONLY)

DEADLINE FOR SAVINGS IS DECEMBER 4!

All Conference and Keynote Sessions are on a first-come, first-served basis, with the exception of the Pre-Conference Workshops. Please choose your package and fill out the form completely. Incomplete forms will be returned. Please use one form per person; make photocopies for additional people.

	Early Discount Registration *on or before 12/4/98 via phone, www, fax or mail*	Regular Registration *(12/5/98-12/30/98) via phone, www or on-site*
❑ **Package 1 – SUPER PASS (Jan. 4-8)** Includes: Pre-Conference Workshops • Lunch (Mon. only) • Keynote Presentation • Macworld/Pro Conference Sessions • MACWORLD Expo Users Conference Sessions • Exhibits • Town Meeting W ____ (Write in your Workshop selection code– see list on page 3 of ad. Forms without workshop selection will be returned.)	$895	$995
❑ **Package 2 – Macworld/Pro and Pre-Conference Workshop (Jan. 4-7)** Includes: Pre-Conference Workshop • Lunch (Mon. only) • Keynote Presentation • Macworld/Pro Conference Sessions • Exhibits • Town Meeting W ____ (Write in your Workshop selection code– see list on page 3 of ad. Forms without workshop selection will be returned.)	$795	$895
❑ **Package 3 – Macworld/Pro Conference (Jan. 5-7)** Includes: Macworld/Pro Conference Sessions • Keynote Presentation • Exhibits • Town Meeting	$595	$695
❑ **Package 4 – MACWORLD Expo Users Conference and Pre-Conference Workshop (Jan. 4-8)** Includes: Pre-Conference Workshop • MACWORLD Expo Users Conference Sessions • Lunch (Mon. only) • Keynote Presentation • Exhibits • Town Meeting W ____ (Write in your Workshop selection code– see list on page 3 of ad. Forms without workshop selection will be returned.)	$395	$445
❑ **Package 5 – MACWORLD Expo Users Conference (Jan. 6-8)** Includes: MACWORLD Expo Users Conference Sessions • Keynote Presentation • Exhibits • Town Meeting	$170	$195
❑ **Package 6 – Full-Day Pre-Conference Workshop (Jan. 4)** Includes: Pre-Conference Workshop • Lunch (Mon. only) • Keynote Presentation • Exhibits • Town Meeting W ____ (Write in your Workshop selection code– see list on page 3 of ad. Forms without workshop selection will be returned.)	$295	$345
❑ **Package 7 – Exhibits ONLY (Jan. 5-8)** Includes: Admission to the Exhibits ONLY. Does not include admission to the Keynote Presentation or Town Meeting	$29	$45

Moscone Convention Center
SAN FRANCISCO

- Pre-Conference Workshop: Jan. 4
- Town Meeting: Jan. 4
- Keynote: Jan. 5
- Macworld/Pro Conference: Jan. 5-7
- Exhibits: Jan. 5-8
- MACWORLD Expo Users Conference: Jan. 6-8

Conditions and Policies:
- Payment must accompany form for registration to be complete.
- Purchase orders not accepted.
- Fax and mail registrations received after Dec.4 will be returned unprocessed.
- This form cannot be used for on-site registration.
- All registration fees are non-refundable and credentials are non-transferable.
- A $20 fee will be charged for all returned checks.

2. CUSTOMER INFORMATION

First Name ____ M.I. ____ Last Name ____

Title ____

Company ____

Street Address (please include apt. #, suite, mail stop, etc.) ____

P.O. Box (if applicable) ____

City ____ State/Province ____ Zip Code/Postal Code ____

Country ____ Telephone ____ Extension ____

Fax ____ Internet/Email Address ____

DEADLINE!

PLEASE READ!

- The Deadline for all fax and mail registrations is Dec. 4. All fax and mail registration received after this date will be returned.
- You may still register at regular prices via Web or phone from Dec. 5 - Dec. 30.
- If you register between Dec. 5 and Dec. 30, you MUST pick up your badge on-site at the On-Site Badge Pick-Up Counter.
- All international (including Canada) attendees must pick up badge on-site at the On-Site Badge Pick-Up Counter.
- Confirmation of registration will be sent once registration is processed. Pre-registration deadline is December 4, 1998
- U.S. Badges will be mailed after December 22 for registrations received through 12/4/98.
- Workshops and Conference Sessions are subject to change. Check our web site frequently for updates: www.macworldexpo.com
- On-Site Registration Hours: January 4: 8:00 a.m.- 4:00 p.m., January 5-7: 8:00 a.m.- 6:00 p.m., January 8: 8:00 a.m.- 4:00 p.m.

3. ATTENDEE PROFILE

MUST BE FILLED OUT TO PROCESS YOUR BADGE.

WHAT IS YOUR INDUSTRY? **(CHECK ONE ONLY)**
- ❑ 1. Accounting/Finance
- ❑ 2. Aerospace
- ❑ 3. Architecture/Construction/Process Industries
- ❑ 4. Art/Design/Creative Services
- ❑ 5. Arts & Entertainment
- ❑ 6. Computer Reseller/VAR/VAD/Service
- ❑ 7. Consulting
- ❑ 8. Education: K-12
- ❑ 9. Education: Higher Ed
- ❑ 10. Education: Other
- ❑ 11. Engineering/R&D
- ❑ 12. Government/Military
- ❑ 13. Health/Medical Services
- ❑ 14. Legal Services
- ❑ 15 Manufacturing (Computer Industry)
- ❑ 16. Manufacturing (Non-Computer Industry)
- ❑ 17 Marketing Sales/PR/Communications
- ❑ 18. Printing/Publishing
- ❑ 19. Transportation
- ❑ 20. Utilities
- ❑ 21. Other____

FOR WHAT PURPOSE ARE YOU PURCHASING/ EVALUATING PRODUCTS AND SERVICES?
- ❑ 22. For My Company/Organization/Department
- ❑ 23. For Myself as Consultant/Sole Proprietor
- ❑ 24 For myself as Consumer

WHAT IS YOUR JOB FUNCTION? (Check One Only)
- ❑ 25. Art Director/Graphics
- ❑ 26. Consultant
- ❑ 27. Controller/Treasurer/Accounting/CFO
- ❑ 28. Corporate Executive
- ❑ 29. OP/IS Management/CIO
- ❑ 30. Editorial/Writing
- ❑ 31. Educator
- ❑ 32. Engineering/Scientific/R&D
- ❑ 33 Human Resources
- ❑ 34. Management/Department Head
- ❑ 35. Marketing/Sales
- ❑ 36. Network Management
- ❑ 37. Professional (Lawyer, Doctor, etc.)
- ❑ 38. Programming/Analysis
- ❑ 39. Purchasing
- ❑ 40. Software Developer
- ❑ 41. Training
- ❑ 42. Other____

WHAT IS THE SIZE OF YOUR ORGANIZATION?
- ❑ 43. Under 50
- ❑ 44 50-99
- ❑ 45. 100-499
- ❑ 46. 500-999
- ❑ 47. 1000 & Over

WHICH PERSONAL COMPUTERS DO YOU USE? **(Check all that apply)**
- ❑ 48. Macintosh Powerbook Series
- ❑ 49. Macintosh Performa Series
- ❑ 50. Macintosh Quadra Series
- ❑ 51. Macintosh Workgroup Series
- ❑ 52. PowerMac
- ❑ 53. iMac
- ❑ 54. PowerMac G3
- ❑ 55. PowerBook G3
- ❑ 56. IBM PC or compatible desktop
- ❑ 57. IBM Laptop/Notebook
- ❑ 58. Other____

ARE THE COMPUTERS AT YOUR ORGANIZATION NETWORKED?
- ❑ 59.Yes
- ❑ 60. No

PRIORITY CODE

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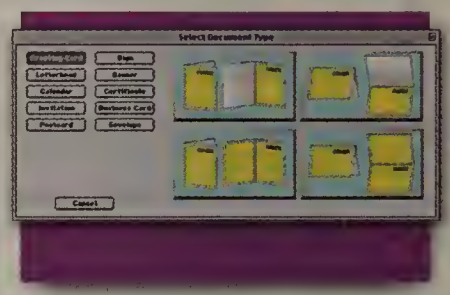

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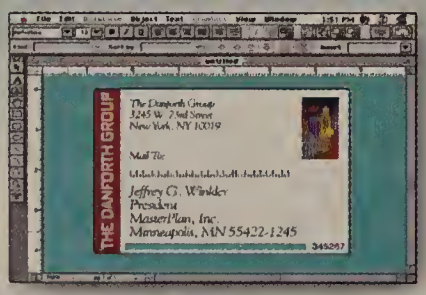

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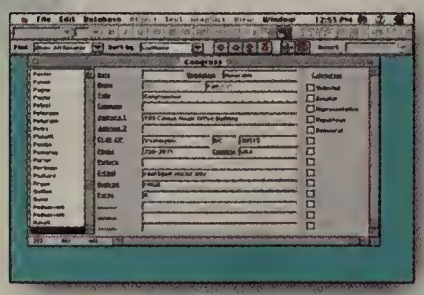

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Secrets

Cache In Your Chips

SPEED UP YOUR MAC WITH INEXPENSIVE CACHES

by Ted Landau

Your Mac has more caches than a squirrel getting ready for winter. Trying to keep them all straight can be tricky, but it's worth the effort. The payoff? Speed. Because caches typically store data in high-speed areas of RAM, your Mac's processor can access that data faster than if it had to retrieve it from slower-speed alternatives, such as the hard disk. The faster the processor can access data, the faster the overall performance.

CHRIS LENSCH

Disk Cache Essentials

The most familiar example of a cache is Apple's Disk Cache, which you set from the Memory control panel. This small amount of RAM is set aside to store information recently accessed from your hard drive. The logic is that if you access that information again, it will be read from the RAM-based cache rather than from the inevitably slower hard drive.

In Mac OS 8, the disk cache has a minimum size of 96K. In general, the bigger the cache, the better the performance; however, you don't want to increase it to the point where there's not enough RAM left to open applications. For most users, the best size is the default (click on the Use Defaults button in the Memory control panel).

An alternative to the Mac's built-in cache is Connectix's Speed Doubler, which offers a component called Faster Disk Performance (see *Reviews*, February 1998). This feature lived up to its name until Apple improved its own cache in Mac OS 8.1; now Apple's version is the speed champ. In fact, if you're running Mac OS 8.1 or later, Speed Doubler actually prevents you from enabling Faster Disk Performance.

Speed Reading and Writing

Device drivers often include drive-specific read-ahead and write-behind caches. A read-ahead cache is similar to a system-level disk cache, but it's fine-tuned for the particular driver software or the drive itself. Although you can use a read-ahead cache and a disk cache at the same time, you may get better results using only the faster of the two.

A write-behind cache accumulates data to be written to disk, transferring it to the disk in one lump rather than with every write request. The downside is that you can lose data if your system crashes before the data is transferred. In the

continues

Putting the Brakes on Browser Cache

WHILE A BROWSER'S DISK CACHE GENERALLY SPEEDS UP PAGE loading, you won't always want a page to load from the cache—perhaps because you want to see if the page has changed since you last viewed it. Both Internet Explorer and Navigator give you options for controlling how the cache works. Using Navigator as an example, here's what you can do to determine when and how your browser uses its cache.

1. The Advanced: Cache item of Navigator's Preferences panel contains settings that determine how often a cached page is compared with the page on the Internet. Once Per Session is the default; to ensure that the browser always checks the Internet before using the cache, select Every Time. To maximize use of the cache, select Never.

2. Even if you select Never, you can still get Navigator to bypass the cache when reloading a page. Simply select Reload from the View menu or, if that doesn't work, do a Super Reload by holding down the shift or option key when you select Reload.

3. To avoid loading all recently visited pages from cache, delete the cache files by clicking on the Clear Disk Cache Now button in the Advanced: Cache item of the Preferences panel. Now, any reloaded page should come from the Internet—except that Navigator retains some information in its memory cache and may still load the page from there. The only way to prevent this is to quit and relaunch Navigator, clearing the memory cache.

4. If pages seem to be loading from cache even when you've set your browser not to use the cache, and your Mac is part of a local network, you may be using a proxy server. In this case, you connect to the Internet via a common machine, the proxy server, that maintains its own cache. To see if you're using a proxy, select Advanced: Proxies from the Preferences panel; if anything but Direct Connection To The Internet is selected, you're using a proxy. To bypass the proxy, select the Direct Connection option, assuming your proxy server allows it.

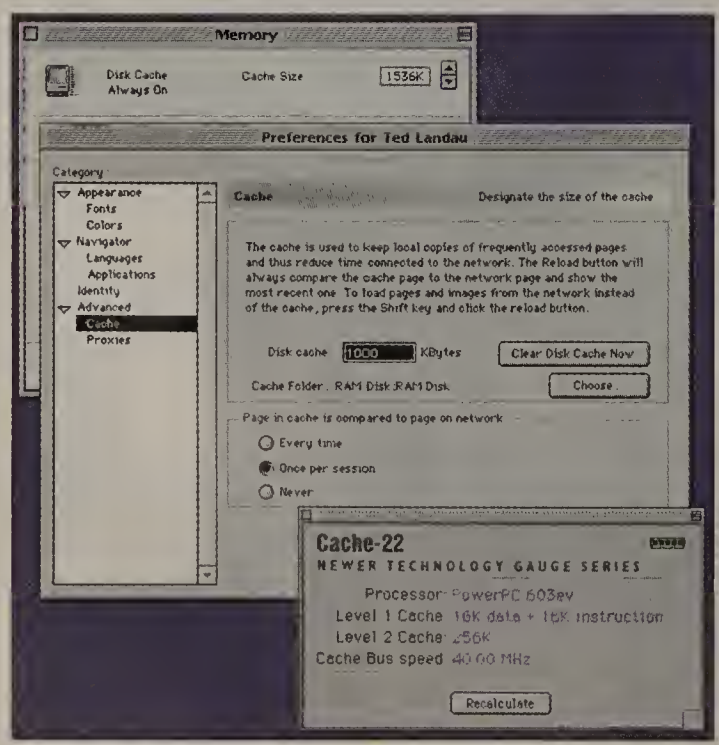
worst-case scenario, you'll need to reformat your hard disk. To prevent the problem from recurring, disable the write cache if your driver software will let you. Better yet, contact Apple or the drive's vendor for a possible fix.

Step Up a Level

With today's speedy Power Macs, even ordinary RAM can't get information to the processor as fast as the processor can use it. Coming to the rescue is Level 2 (or L2) RAM cache, so called because the processor itself includes a small amount of ultrafast RAM (called Level 1 cache).

L2 cache comes either on a separate card that you insert in a slot on the logic board or, for G3 Macs, built onto the processor card itself (but separate from the L1 cache, which is also on the card). This built-in *backside cache* is significantly faster than a separate cache card because data doesn't have to travel over the relatively slow system bus on the logic board to get from the cache to the processor. In fact, leaving an L2 cache card in a Mac that has been upgraded with a G3 processor card may actually slow down overall performance.

Want to know how much L2 cache you have installed—or if you have any installed at all? Just run a utility such as Newer Technology's (www.newertech.com) freeware Cache-22 (see "A Medley of Caches"). Like other such utilities, Cache-22 works most reliably if you first disable virtual memory or Connectix's RAM Doubler.



A Medley of Caches When you go hunting for cache locations and settings, here's where you'll find them: Apple's Memory control panel (top); Netscape Navigator's Advanced: Cache item in the Preferences panel (middle); and Newer Technology's freeware Cache-22 (bottom), which displays the L1 and L2 cache sizes.

Speed Up the World Wide Wait

Web browsers use their own caches to boost performance. A browser's disk cache stores files on your drive for every page you visit; when you revisit a page, the browser loads it from cache rather than from the Internet.

To view the cache settings in Netscape Navigator 4.0, go to the Edit menu and select Preferences: Advanced: Cache. Click on the Choose button to select a location other than Navigator's Preferences folder in which to store your cache files. (Microsoft Internet Explorer has similar settings in its Preferences panel; go to Web Browser and select Advanced.) To speed up page loading even further, store the cache files on a RAM disk (see "Supercharge Your Browser," June 1998).

Navigator maintains yet another cache, called the *memory cache*, that stores data in RAM rather than on your disk. But instead of using settings to adjust the size of the memory cache, you change it indirectly by increasing or decreasing Navigator's Preferred Size in the Get Info window. To force Navigator to make even better use of the memory cache, set the browser's disk cache to zero in Preferences: Advanced: Cache. Of course, to get the speed benefits of these changes, you need plenty of spare RAM.

You can also use ResEdit to modify the memory cache size directly:

1. From ResEdit, open a copy of Navigator (or Netscape Communicator).
2. Open the TEXT resource.
3. Open the allprefs (ID: 3010) item.
4. Scroll down to the line that reads **pref("browser.cache.memory_cache_size", 1024).**
5. Replace 1024 (the default size of the memory cache) with a larger number, such as 4096.

Note: If no text is visible in allprefs, don't attempt to modify the resource.

Caching In

All the cache in the world won't transform an aging Quadra into a G3 powerhouse. But no matter what model you have, caches can give your Mac a welcome speed boost. **m**

Contributing Editor TED LANDAU is the Webmaster of MacFixIt (www.macfixit.com) and the author of *Sad Macs, Bombs, and Other Disasters* (Peachpit Press, 1997).

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Quick Tips

Tips, Tricks, and Shortcuts

by Lon Poole

Once you discover that you can control audio CDs with the Control Strip in Mac OS 8.X, you may think the AppleCD Audio Player program is obsolete. But Michael Saji of West Hills, California, discovered that if you enter a CD's track titles in Audio Player, they appear in the Control Strip in addition to the generic track numbers. You need do this only once for each CD, because Audio Player stores track titles together with other information that identifies the CDs. The next time you insert the same audio CD, the audio-CD Control Strip module, CDStrip, recognizes it and displays its track titles (Audio Player doesn't have to be running when you insert the CD).

If you use either Audio Player's shuffle or program mode, the Control Strip displays the shuffled or programmed track list. But the next time you insert the same CD, the Control Strip and Audio Player may not display a track list if the Enable Audio CD AutoPlay option is turned on in the QuickTime Settings control panel. So to display the track list, open Audio Player and set the CD to normal mode. Then you can set the mode to shuffle or program again, and it will show the old playlist.

You can import audio-CD information from another Mac by copying the CD Remote Programs file from the other Mac's Preferences folder to yours. The imported CD information replaces any existing information. Or, to load album and track titles into Audio Player without a lot of typing, use RiverSong Interactive's TitleTrack CD Player (www.titletrack.com/TitleTrack_Download.html). This $15 shareware audio-CD controller downloads album and track titles from the CDDB database of 180,000 audio CDs on the Internet (www.cddb.com).

Displaying Extensions Manager at Start-Up

Q. While watching G3 Macs starting up at a local store, I noticed the Extensions Manager control panel opening during start-up, allowing the store's employees to choose from among different extension sets. I tried this with Mac OS 8.1 at home but couldn't figure out how to do it. How do I access Extensions Manager at start-up?

SIMON STRANTZAS
Toronto, Ontario, Canada

A. Hold down the shift key during start-up and Extensions Manager will appear. You can then choose an extension set or activate and deactivate extensions individually in the usual manner. Close the Extensions Manager window to resume start-up. If you activate or deactivate an item that loads *before* Extensions Manager does, you need to restart rather than resume. To restart the computer, ⌘-option-click the Extensions Manager close box.

You can't configure Extensions Manager to appear automatically during start-up, but you can set this kind of preference with commercial extensions managers, such as Casady & Greene's $70 Conflict Catcher (831/484-9228, www.casadyg.com).

Unlocking Disk Names

Q. I was going crazy trying to rename my Zip disks. After renaming, the disks would revert to the default name of Zip 100. I installed the latest Iomega drivers, to no avail. I rebuilt my desktop and ran all sorts of nifty disk diagnostics. Nothing. Then I tried restarting with extensions off and a Zip disk in the drive. Voilà! I could now rename the disk. But is there a more convenient way to solve this problem?

DAN DISTEL
Orono, Maine

A. You can't rename disks (except floppies) while file sharing is turned on. Although you can go through the motions of renaming a removable disk right after inserting it, Mac OS rejects the name change as soon as it gets the disk ready for file sharing. You can turn file sharing off and on using the Control Strip, if it's enabled. Otherwise, use the File Sharing control panel (Mac OS 8.X) or the Sharing Setup control panel (Mac OS 7.X). Starting up with the shift key pressed

continues

JEFFREY PELO

down also disables file sharing (in addition to all extensions).

Moving the Control Strip

Q. The Control Strip on my Mac does not appear in the lower–left-hand corner—it's displayed about two inches up on the screen. How do I get it back into the corner?

ARTHUR FLECK
Iowa City, Iowa

A. If you press the option key as you click the Control Strip's tab, you can move the Control Strip up and down along the side of the screen, and to the opposite edge of the screen. You can also option-drag items on the Control Strip to rearrange them. For detailed information and answers to other Control Strip questions, use the Finder's Help menu (Mac OS 8.X) or Guide menu (Mac OS 7.X).

Organizing the AutoText Menu

Q. I'm a fan of Microsoft Word's AutoText feature. When I installed Word 98, I was pleased to see my existing AutoText files appear in the Normal category of the AutoText menu. (This menu normally appears as a submenu of the Insert menu and in the AutoText tool bar.) I later created a new AutoText entry of some text in a document-header paragraph. Word placed this entry in the Header/Footer category. I would prefer to have this entry in the Normal category like my older AutoText header text. Is there a way to manipulate or sort the AutoText menu categories and their contents?

MARK MORRIS
Fairfield, Ohio

A. The paragraph style of text that you select to become an AutoText entry determines its AutoText category. Therefore, you need to put your header text into a paragraph whose style is Normal. One approach is to temporarily change the paragraph style of the header to Normal. Another is to copy the text from the header, temporarily paste it into a Normal-style paragraph, and make an AutoText entry from the pasted text. You can even option-drag a copy of the text from the header to a new document and make the AutoText entry from there.

You may have noticed that although AutoText entries in the Normal category are available in most paragraphs, they are not available in a header or footer. If you want the same AutoText entry to be available in both the Header/Footer category and the Normal category, you must make two AutoText entries. Make one from text selected in a paragraph whose style is Header or Footer, and the other from a paragraph whose style is Normal.

Accessible Artwork You can drag blocks of text and artwork—in addition to colors, patterns, and gradients—into Adobe Illustrator's Swatches palette for instant access.

Illustrator Image Browser

TIP In Adobe Illustrator, you can drag not only colors, patterns, and gradients into the Swatches palette but also blocks of text and artwork. You can reuse these items simply by dragging them back into the work area. It's an easy way to increase your Illustrator efficiency.

GREGORY MABLY
Toronto, Ontario, Canada

Boosting Acrobat Distiller Speed

TIP If you create a lot of PDF files with Adobe Acrobat Distiller and want to make the program a bona fide production screamer, make sure you have virtual memory turned on in the Memory control panel. For even more speed, run Distiller from a RAM disk. In my tests, distilling a 14.5MB PostScript file to a 1MB PDF file took 123 seconds with virtual memory turned off, but only 47 seconds with it turned on. When I ran Distiller from a 15MB RAM disk, the same job took only 28 seconds —an improvement of over 400 percent! A real-world job of distilling a folder full of PDF files used to take 3 hours but now takes 45 minutes. (Of course, because PostScript files differ in complexity and composition, your performance gain may vary.)

Although running Distiller from a RAM disk boosts the program's performance, the time I saved distilling the PostScript file was essentially canceled out by the time I spent copying the program to the RAM disk. But you can avoid having to copy the 15MB Distiller application folder to the RAM disk each time you start up, by creating a non-volatile RAM disk (its data doesn't disappear at shutdown) with RamBunctious, a $12 shareware utility by Bob Clark and Elden Wood, instead of with the Memory control panel, which doesn't guarantee the saving of RAM-disk data. RamBunctious automatically saves the RAM-disk contents to your hard disk when the computer shuts down. With the price of RAM so low, just about anyone can afford to allocate a spare 16MB for a RAM disk.

Another surprise: I found that Distiller ran marginally slower when I *increased* its memory size (via its Get Info window)—the standard memory allocation made it run fastest. What's more, increasing font inclusion to 99 percent from the default 35 percent had no significant effect on performance.

HOWARD BELL
Christchurch, New Zealand

LON POOLE answers readers' questions and selects reader-submitted tips for this monthly column. His latest book is *Macworld Mac OS 8 Bible* (IDG Books Worldwide, 1997).

All shareware and freeware mentioned in *Quick Tips* is available from the Macworld Online software library (www.macdownload.com).

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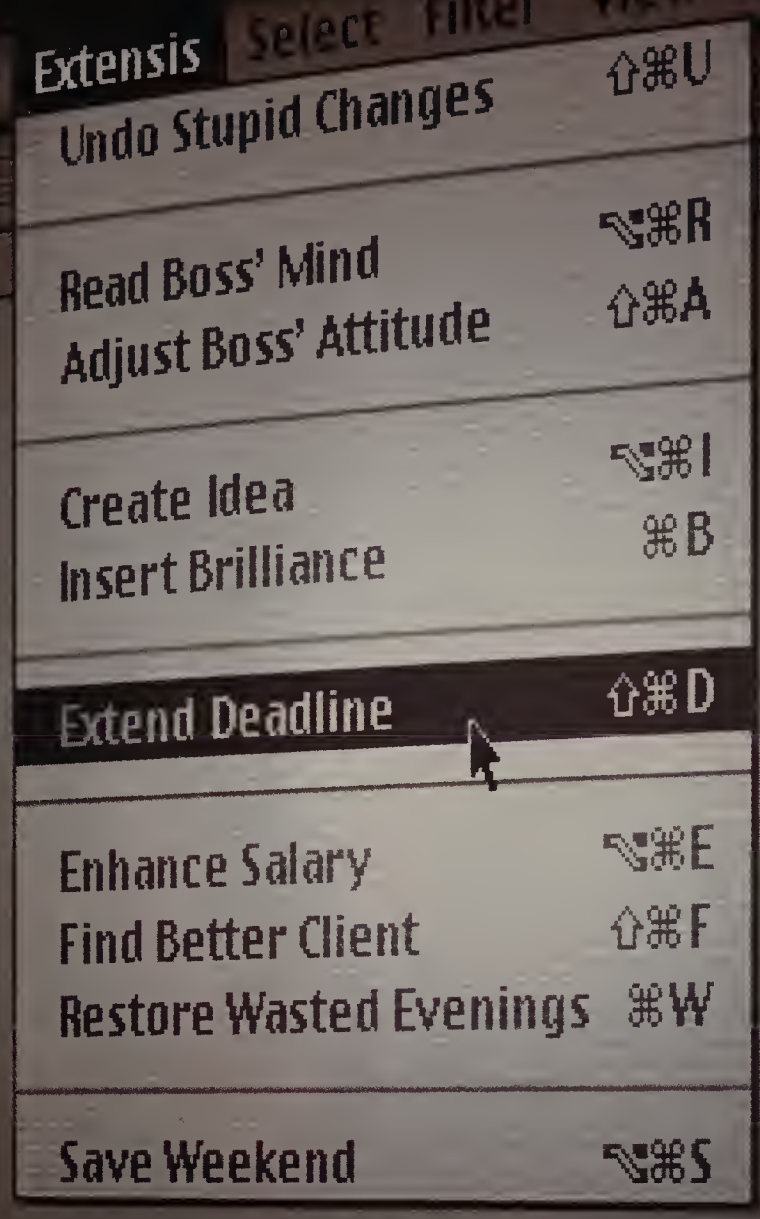

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Illustrating with 3-D Art

Five Ways to Turn 3-D Clip Art into Instant Designs

by Janet Ashford

Need a realistic illustration of a saxophone for a summer jazz concert brochure, a bowl of shiny fruit for a local restaurant's menu graphic, or a cityscape for a municipal poster? You could labor over detailed drawings in Adobe Illustrator or Macromedia FreeHand—or you could just use 3-D clip art.

Surprised? People usually think of 3-D software as the province of dedicated 3-D modelers who turn out elaborate and futuristic creatures, landscapes, and spaceships for computer games. But the increased availability of 3-D clip-art models —which include many common, everyday objects plus the occasional spaceship— makes it possible for 3-D novices to make illustrations using software such as MetaCreations' Ray Dream Studio (see *Reviews*, December 1997) or Ray Dream 3D (see *Reviews*, February 1998), Strata's Vision3D, or NewTek's Inspire 3D (see *Reviews*, August 1998). There are also special plug-ins for Adobe Photoshop, such as Vertigo's 3D Dizzy, that let you import 3-D models and manipulate a few variables, but these give you less control than a regular 3-D program does.

The Hard Work's Done

Using 3-D clip art means you don't have to master the somewhat difficult and time-consuming techniques involved with 3-D modeling—such as extruding, lathing, and working with mesh objects, splines, and Boolean combinations. The folks who created the clip art have done all that work for you. Your task is simply to learn the basics of your 3-D software. With these basics in hand, you can customize 3-D clip art in several ways for your illustration needs: combine 3-D elements to create new elements, change surface textures, create appropriate lighting, and position cameras to capture the perspective you want. You can also use filters to alter the "3-D look" and disguise the source of your art.

Some of the aforementioned software packages include 3-D clip art, but you can also buy 3-D clip-art collections from such vendors as Zygote Media Group (www.zygote.com, 801/375-7220) and Viewpoint DataLabs (www.viewpoint.com, 801/229-3000). These clip-art files typically come in file formats such as DXF and 3DMF, which are easily imported into most 3-D programs. I used MetaCreations' Dream Models, included with Ray Dream Studio and Ray Dream 3D, as my source of clip art for this article. I created the examples in Ray Dream Studio, except where noted.

The Final Integration

When you've tweaked your 3-D model to your satisfaction using any of the five methods illustrated on the following pages, render it as a PICT or TIFF file. You can then open it in an image-editing program, such as Photoshop or MetaCreations' Kai's Power Tools, and add filters or text. Some 3-D programs also let you save images as EPS files, which you can edit in Illustrator or FreeHand. Voilà —instant illustrations from 3-D art!

If you've never considered using 3-D artwork in creating illustrations, now's a good time to try it. m

JANET ASHFORD (www.jashford.com) is a co-author of *Getting Started with 3D: A Designer's Guide to 3D Graphics and Illustration* (Peachpit Press, 1998).

continues

LARRY GOODE

1. Combine Models

USE 3-D CLIP-ART MODELS ALONE, DISMANTLED, OR IN COMBINATION TO CREATE CUSTOM TABLEAUX.

Collections of 3-D clip art usually include models of common objects such as furniture, vehicles, kitchen utensils, office equipment, and food. Most models are made of smaller elements that are grouped into logical units. For example, a bicycle might be composed of two wheel groups and a frame group. You can ungroup these further until you get down to the cubes, spheres, and other shapes that make up the object. Ungrouping and taking apart clip-art models lets you isolate the parts you want to use, and it's a great way to learn how 3-D models are constructed.

You can position, scale, and rotate 3-D models using the same familiar functions found in illustration programs. Move elements around, make them bigger or smaller, and combine elements from different models to create evocative illustrations. Think of single objects as metaphors and combine them in a meaningful way.

Here I took a model of a key and a model of a fancy door and suspended both in a sky environment with the door open to reveal the key.

2. Change Surface Textures

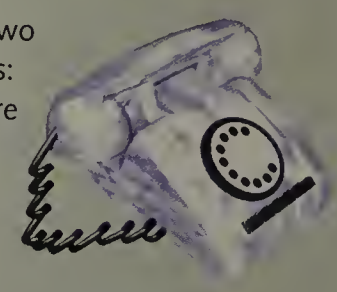
REPLACE OR EDIT THE PREFAB TEXTURES ON 3-D CLIP ART MODELS TO CREATE DIFFERENT EFFECTS.

Most 3-D programs include an extensive library of surface textures, with changeable attributes, that can be applied to any object. I applied these textures using the defaults for *mapping* (how textures are wrapped around an object), so the textures were applied differently to each part of the phone. Experiment with mapping methods (spherical, cubical, and so on) to find the one that best suits the object you're texturing.

(A) I started with a telephone model that came with a non-reflective, plastic-like red surface.

(B) I edited the texture map's color channel, and increased the reflectivity to create the look of a shiny, gold-plated phone.

(C) I then tried two different textures: a blue-sky texture provided a surrealistic treatment . . .



(D) . . . while a giraffe-skin texture made a more Dadaist statement.

3. Capture a New Perspective

CHANGE CAMERA POSITION AND ANGLE TO GRAB A DRAMATIC VIEW.

Once your textured models are in place, experiment with camera positions to find the perspective you want. Because 3-D models are "solid," you can zoom in on any detail or get any angle you can imagine. Sometimes you need only change camera position to achieve a great final illustration.

Three-dimensional cameras include lenses —such as telephoto and wide-angle—that imitate those of real-world cameras. Some programs also provide pan, track, and dolly functions that let you manipulate cameras like a movie director. Most 3-D programs let you watch your scene simultaneously update in another window as you move the camera.

Most 3-D programs let you add several cameras to a scene and switch among the various views—handy for experimenting.

(A) Here I started with a model of a stock car and positioned two cameras to capture close-up views:

(B) one of the engine . . .

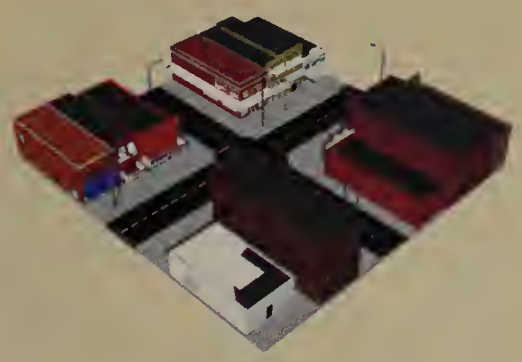
(C) . . . and one of the right front tire.

4. Create Mood Lighting

INSTANTLY TRANSFORM THE ATMOSPHERE OF YOUR ILLUSTRATION WITH LIGHTING—YOU CAN CREATE ENDLESS, DISTINCT VARIATIONS ON A SINGLE 3-D MODEL OR SCENE.

Three-dimensional software programs usually include four types of light sources: ambient light (which casts a soft overall light without shadows), directional light (which behaves like sunlight), spotlights (which can be aimed in a particular direction), and point lights (which shed light in all directions, just like lightbulbs).

You can edit these lights to create the effects you want by changing their position in 3-D space, the direction in which they point, and their color. You can also use gels to cast interesting shadows on a scene, such as leafy foliage or the horizontal stripes of window blinds.



(A) Here I started with a model of a city block and positioned a camera to capture a close-up view of one group of buildings.

(C) I created a late-afternoon look by moving the directional light low in the 3-D sky and coloring it yellow, and substituting a dark, cloudy-sky background.

(B) I made a scene of the buildings at high noon by positioning a white directional light directly overhead and adding a blue-sky background.

(D) I evoked a nighttime mood by positioning yellow spotlights to shine down from the street lights in the model, and adding a dark-blue gradient background.

5. Filter Out the 3-D Look

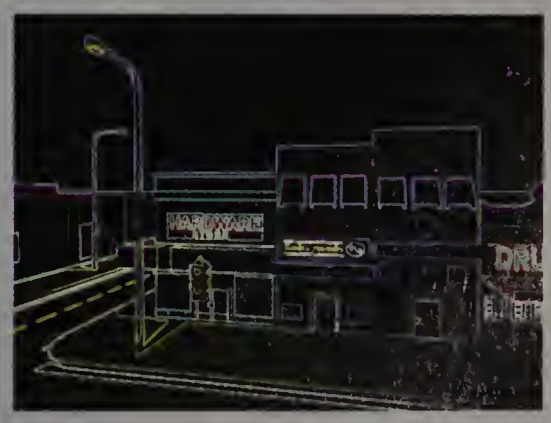
SOFTEN THE OFTEN SHINY, INDUSTRIAL LOOK OF 3-D RENDERINGS BY EXPERIMENTING WITH FILTERS.

Special filters included in many 3-D programs, and filters in image editors such as Photoshop or paint programs such as MetaCreations Painter, will help you make 3-D models look less like 3-D models and more like traditional illustrative art. No one would guess that any of these images started life as a 3-D model.

(B) I rendered the car tire as a TIFF file, opened it in Photoshop, and applied Photoshop's Poster Edges filter to give it a hand-drawn appearance.

(A) Here I used Ray Dream 3D's built-in Basic Draw filter to create the blue phone's cartoony, sketched look.

(C) I followed the same process with the city night scene and applied the Find Edges & Invert filter from MetaCreations' Kai's Power Tools to create a neon effect.



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Transform HTML with Regular Expressions

Powerful Search-and-Replace Tool Makes Over Your Web Site in a Flash

by Jason Snell

Creating Web pages can be an exciting experience; after all, the Web is on the cutting edge when it comes to publishing technology. But when you have to update dozens of lines of code manually to make a minor design change, working with HTML can be infuriatingly tedious.

But making global changes to your code doesn't have to be time-consuming, if you use *regular expressions*. This special search-and-replace feature (often called *pattern matching* or *grep*) is built into most HTML editors, including Bare Bones Software's BBEdit, Peter Keleher's Alpha, and GoLive Systems' CyberStudio. Regular expressions amplify the power of traditional search-and-replace commands by letting you search for *patterns* of text and then selectively modify what you've found. That added power makes regular expressions a great tool for modifying HTML files quickly and painlessly.

To take advantage of this power, you have to learn the symbols used to build searches (see the table, "Decoding Regular Expressions," for a partial list). Regular expressions look incomprehensible at first glance, but once you learn a few rules, they'll save you hours of work.

The Basics

Regular expressions are powerful because they let you search for dozens of permutations of text with a single trip to a Find window. For example, you could search for any **<font>** tag and find **<font>**, **<font face="Helvetica">**, or even **<font size="+2" face="Arial,Helvetica" color="#990000">**. Once you've found text, you can perform tricks such as changing the order of the text or inserting text within a found item.

A regular-expression search is like a normal search: you enter some text, and the program tries to find text that matches it. What makes regular expressions so powerful is that you can use wild-card characters to match all sorts of patterns in addition to exact text strings.

Optional Items Say you want to search for a word that can be spelled various ways. For example, if you search for *color*, you'll find every instance of *color*. But if you search for *colou?r*, you'll find all occurrences of both *color* and *colour*. That's because the question mark means that the character immediately preceding it is optional—in other words, the expression will accept a *u* if it finds one, but it doesn't *need* to find one.

Repeating Items The plus sign and asterisk, cousins to the question mark, find repeating text rather than optional text. Because the plus sign finds one or more of the same character, searching for *90+* matches *90*, *900*, and *9000*, for instance, but not *9*. The asterisk finds zero or more characters, so searching for *90** will match *9*, *90*, *900*, and so on.

When you start crafting regular expressions, you may experience unexpected results. Chances are good that the problem involves the asterisk or the plus sign, which are quite powerful but also greedy: they try to match the largest amount of text possible. Avoid searching for open-ended expressions such as .* or .+—which find as much of any character (signified by the period symbol) as possible—and target your expressions at specific characters.

Wild Cards on Demand One powerful feature of regular expressions involves text in brackets. The text inside the brackets is sort of a do-it-yourself wild card: *[0-9]* will match any numeral, and *[aeiou]* will match any vowel. You can put brackets around either a "run" of characters (say, from *A* to *J* or *1* to *5*) or a list of individual characters. For example, if you want to match only 1, 2, or 3, you can search for either *[1-3]* or *[123]*—they mean the same thing. If you search for *gr[ea]y*, you'll find all instances of both *gray* and *grey*.

An even more powerful use of brackets involves excluding characters from the search. If you insert a caret (^) in the bracketed item, your search will exclude

continues

RICHARD DOWNS

words that contain the character following the caret. For example, a search for *hell[^]** will match any word that starts with *hell*, such as *hello*, *hellacious*, and even *hell-on-wheels*. By searching for any character except a space, you've limited your search to single words.

The Power of Parentheses Symbols that search for repeating characters are powerful, but they affect only the item they follow—and how often do you have to find eight repetitions of a letter? However, you can get those symbols to match entire groups of characters by using parentheses.

Parentheses have two important uses in regular expressions. First, you can surround anything with parentheses to make the contents a single "item" for use with wild cards. For example, a search for *(hedge)?hog* would match both *hedgehog* and *hog*, since the question mark makes the item preceding it, *hedge*, optional.

Even more important, parentheses let you save what you've found so you can use it when you're replacing text. When you put any item in parentheses, any text the expression matches is automatically stored for later use. Each set of parentheses is assigned a number, starting with 1 for the first set. When it comes time to insert that stored text into your replacement text, you refer to it using a backslash (\) followed by the appropriate number. In the previous example, *\1* would contain *hedge* if the expression

Decoding Regular Expressions

Symbol	What It Means	Example	What It Might Find
+	find 1 or more of preceding item	ta+	ta, taa, taaa
*	find 0 or more of preceding item	ba*	b, ba, baa, baaa
?	preceding item is optional	ab?c	abc, ac
.	match any character (except return)	1.2	1 2, 122, 1d2, 1$2
[^x]	match any character except *x*	us[^a]	usb, usc, usd, use
[0-9]	match any digit	9021[0-9]	90210 through 90219
^	match start of line	^hello	matches *hello* only at beginning of line
$	match end of line	end$	matches *end* only at end of line
( )	group items together	(ab)+	ab, abab, ababab

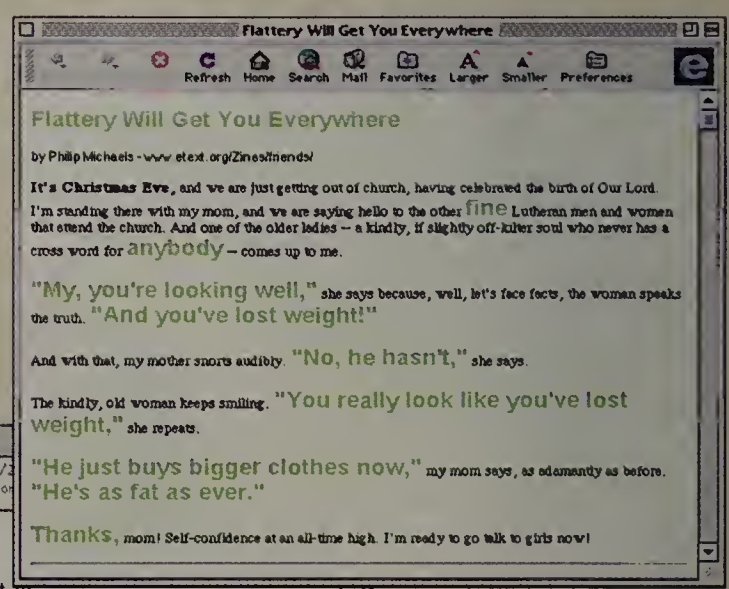
Spruce Up Plain Text

ONE OF THE WEB SITES I MANAGE FEATURES ARTICLES SUBMITTED via e-mail. Once I get that mail, I have to convert it to HTML before posting it online. Since most of the writers use underscores to represent emphasized text, I have to convert all underscored text to some sort of HTML style. Rather than deleting underscores and replacing them with HTML tags by hand, I let a regular expression handle it.

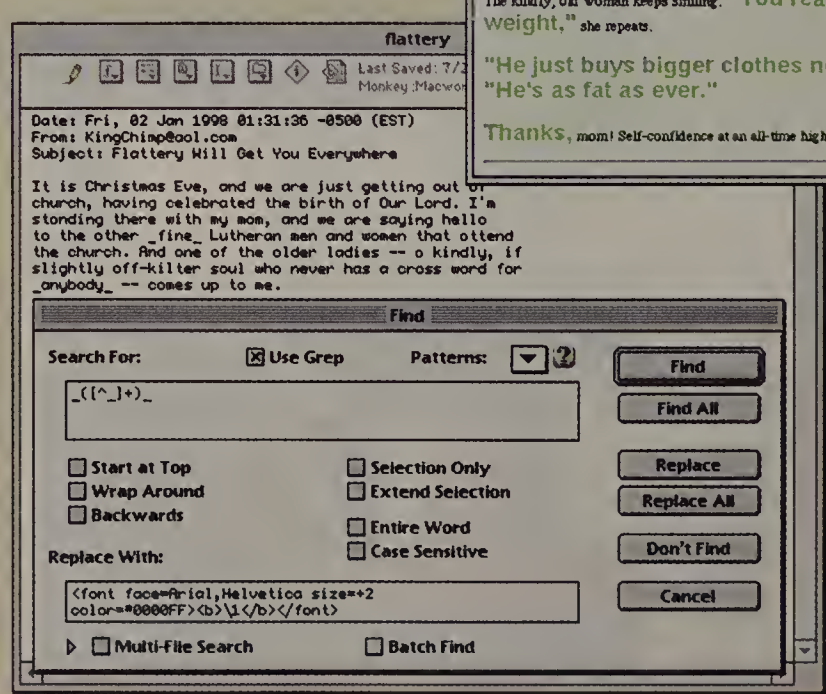
The expression in question is _([^_]+)_, or, to translate: find an underscore, followed by one or more characters that aren't underscore, followed by another underscore, saving the text between the underscores for later use by placing it in parentheses. Here, I've chosen to give that emphasized text the royal treatment, making it bold, brightly colored, and several point sizes larger and styling it in a different font. I do this with the following replacement expression:

```
<font face=Arial,Helvetica
size=+2 color=#660000>
<b>\1</b></font>
```

In real life, I usually just italicize the text with the expression \1.



The transformed HTML file: words originally underscored are now big and bold



The original, unformatted file in BBEdit

matched the word *hedgehog*, and nothing if the expression matched only *hog*.

Here's another example: a search for **<img src="([^"]+)">** will match a plain HTML **<img>** tag; the name of that image, which lies between those parentheses, will now be the contents of *1*. Say you want to use this expression to replace an existing **<img>** tag with one that lists the name of the file in the image's *alt* (alternative text) variable. All you need to do is enter **<img src="\1" alt="\1">** in the Replace box to quickly replace items such as **<img src="jason.gif">** with **<img src="jason.gif" alt="jason.gif">** throughout your document.

Searching for Special Characters What if you want to search for a character that's part of the regular expression? Just put a backslash (\) in front of it. A search for *1*+ will match *11*, *111*, and so on, but a search for *1*\+ will find only *1*+.

For Further Study

Regular expressions can be extremely powerful—and extremely complicated. If you're interested in learning more, there's no better resource than Jeffrey E. F. Friedl's *Mastering Regular Expressions* (O'Reilly, 1997). It's a great source of sample expressions and detailed explanations of how regular expressions work their magic. And if you want to add regular-expression capabilities to a Mac application that doesn't have them built in, check out PreFab Software's (www.prefab.com) $55 Text Machine; this stand-alone utility offers search features even BBEdit can't match. **m**

Senior Editor JASON SNELL has been publishing on the Internet since 1991.

Taking Text to Tables

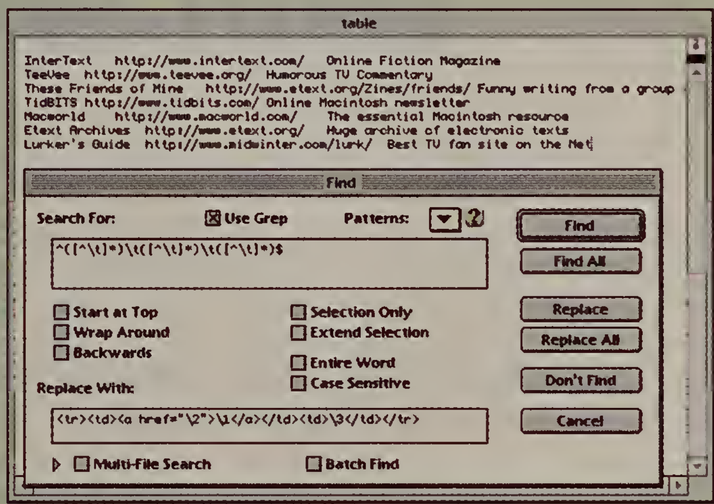
REGULAR EXPRESSIONS ARE GREAT FOR CONVERTING PREFORmatted text into a different format. Let's say someone gives you a tab-delimited text file containing items you need to place in an HTML table. On each line are three items: a name, a URL, and a description. You could convert that file into a table by hand, but a regular expression can do it in a flash: just search for

^([^\t]*)\t([^\t]*)\t([^\t]*)$

and replace it with

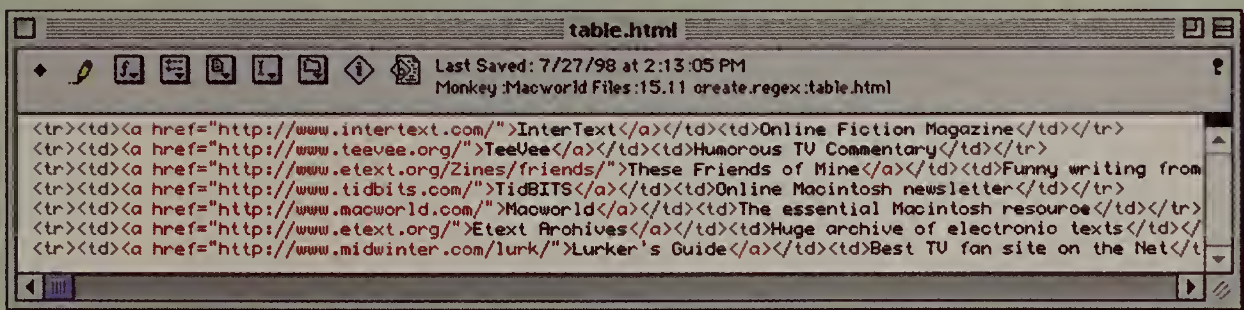
<tr><td>\1</td><td>\3</td></tr>

The result is a search-and-replace action that takes each line of a three-field, tab-delimited text file and converts it into one row of an HTML table. Just add **<table>** and **</table>** tags.



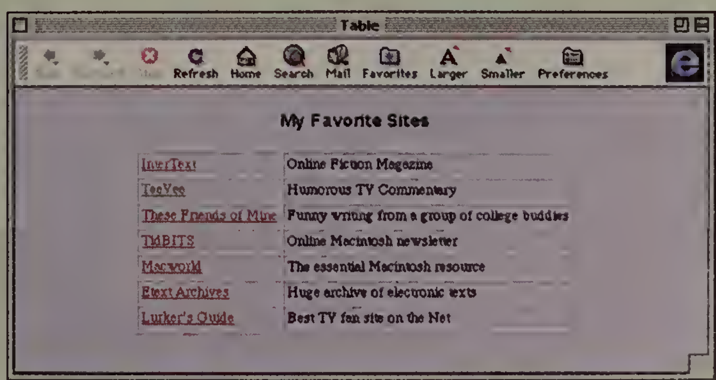
The original, tab-delimited text file in BBEdit

Let's break down this expression. The first caret indicates that you're finding only items that start at the beginning of a line. It's followed by **([^\t]*)**, which finds as many characters as it can, as long as they aren't tabs (**\t** is shorthand for the tab character). Since it's all within parentheses, the results will be stored in a variable for use when you replace the found text. Next is a tab, another group of as many characters as possible that aren't tabs, another tab, and another group of as many characters as possible, up to the dollar sign—the end of the line.



The transformed text file in HTML form

What this expression does is grab all three collections of text located between the tabs of your tab-delimited text file and store them as variables by using parentheses. You can then use the *1*, *2*, and *3* variables in your Replace box as placeholders for the found contents of the first, second, and third tab-delimited fields. You don't have to use those fields in order, either. Since the name field came before the URL field in this example's original text, the former is stored in *1*—that's why *2*, the URL field, appears before *1* in this example.



The final, rendered version of the file

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Photoshop Show-and-Tell

Create Simple, Stunning Presentations without Multimedia Software

by Cathy Abes

You can manipulate images into almost anything imaginable with Adobe Photoshop—but did you know that you can use it to create simple, self-running presentations? Photoshop's oft-overlooked Actions palette, which records and "plays back" your selected Photoshop processes, is your key to faking a moving animation or slide show within Photoshop. Version 5.0's Playback Options dialog box further simplifies the job, giving you options that allow you to run a set of actions in the style of a Microsoft PowerPoint presentation. So if you don't have PowerPoint or a multimedia-authoring package like Macromedia Director, fear not. For simple slide shows or presentations that don't include sound or real animation, you already own the tool you need.

The beautiful presentation deconstructed here was created by accomplished Photoshop artist, college lecturer, and book author Bert Monroy. Apple commissioned the presentation for its recent rollout of the iMac and the G3 PowerBooks. Apple wanted the presentation done in Photoshop so that interim CEO Steve Jobs could play it by simply pressing a button. Although Monroy first created this presentation in Photoshop 4.0, he later converted the file to Photoshop 5.0 because of its additional playback options. You can see a QuickTime movie of the final presentation at www.macworld.com/more/.

Building with Layers

Although the Actions palette is typically used to automate multistep Photoshop tasks you do on a regular basis, Monroy took it one step further. He created the illusion of movielike animation by running a series of simple processes in a many-layered Photoshop file (see "Making a 'Movie' in Photoshop"). He started the project with a single sky image and created numerous duplicate layers of the same image at increasing opacities, stacking them from the bottom up. His intended effect was to have the opacity build as each of the layers was turned on, making the sky appear to fade in.

To build the metallic-looking frame, Monroy created a series of channels that would make masks on a designated layer and would be filled with color and texture to create the look of a three-dimensional frame. He created more layers containing each of the frame's details: the corner lines, screws, and screw shadows (all created in Photoshop).

Monroy then added a single layer with an image of a globe. Next he added an image of a man's head, making duplicate layers of it with increasing opacity as he did with the sky images. This would give the same illusion of the man's head fading into the scene. He added another layer with an image of the man's head at 100 percent opacity with the globe mapped onto it. When this layer was activated after the head's fade-in, it would appear that the globe and the head had merged into one. The last thing he added to this multiple-layered Photoshop file was the final image with the components in place: the sky and the man's head with the globe mapped onto it, all at 100 percent opacity.

When Monroy finished creating all these layers, he clicked on the Actions palette's record button and began manipulating the layers and channels to transform the static Photoshop file. When the Actions palette finished recording, a single click of the play button would step through the process and run the Photoshop "movie." m

CATHY ABES is an editor at *Publish* and author of *Photoshop F/X* (Ventana Press, 1994). BERT MONROY is a Photoshop guru and author of many Photoshop books, including his most recent coauthored title, *Photoshop Channel Chops* (New Riders, 1998).

continues

Making a "Movie" in Photoshop

1 The Actions palette is the heart of a Photoshop slide show or presentation. It records your processes by tracking keyboard commands, tool uses, color changes, layer and channel selection and manipulation, and so on. It's also what you use to play these processes back as a running presentation.

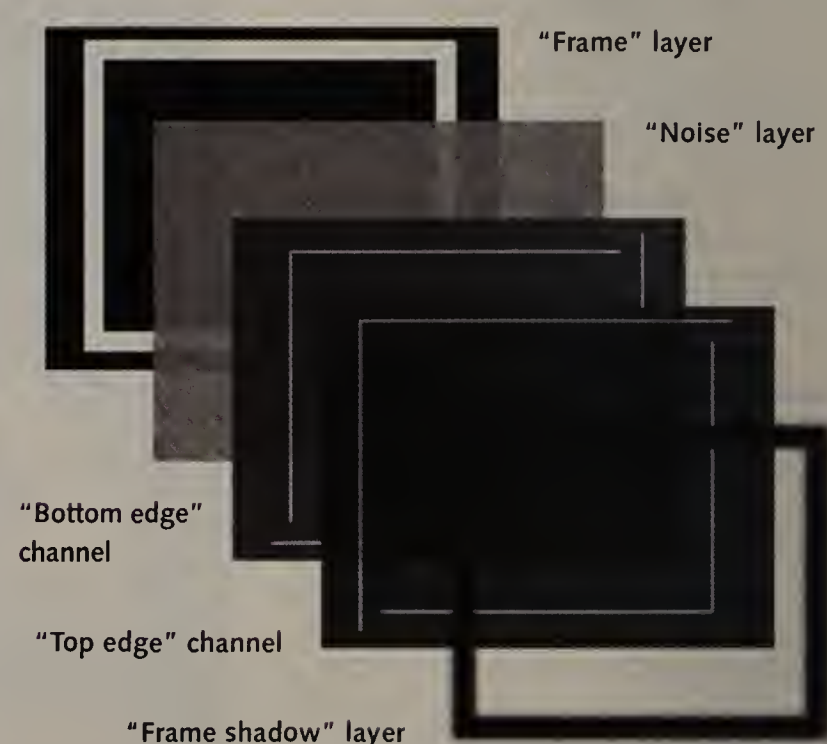
TIP Once you begin playing a presentation using the Actions palette, you can pause it by clicking the stop button at the bottom of the palette and resume by clicking the play button. Since this requires keeping the palette open while the presentation runs, you'd probably want to hide the palette on a second monitor.

These VCR-like controls in the Actions palette let you record and play back Photoshop processes.

2 Monroy began building his presentation with a dark-to-light-blue gradient layer (**A**) created by picking the darkest and lightest blues from a photo of sky and clouds. He gradually built opacity by layering the sky-and-cloud photo on top of the gradient. First he added the photo at 20 percent opacity (**B**). He then added a second layer of the photo at 30 percent (**C**), a third layer at 30 percent, and finally a fourth at 40 percent opacity (**D**). As these layers stack up, the sky appears to fade in.

3 The final sky layer Monroy activated had its opacity set to 100 percent. This is a step that might seem unnecessary since the previous opacities add up to more than 100 percent. However, unless you specify full opacity, some of the underlying image will still show through.

4 Monroy's next step was to create the 3-D, metallic-looking frame. He loaded a channel with a simple rectangular outline into the designated frame layer and then activated another layer containing a "noise" texture. He then created a clipping group of these two layers to mask out the frame and fill it with the noise texture. Next he loaded the "bottom edge" channel, filled it with the foreground color (black), and exchanged the foreground and background colors. Then he loaded the "top edge" channel and filled it with the foreground color, which was now white. This gave the appearance of bevels on the frame. He finished the frame by activating layers with the frame corners, screws, screw shadows, and the frame's shadow.

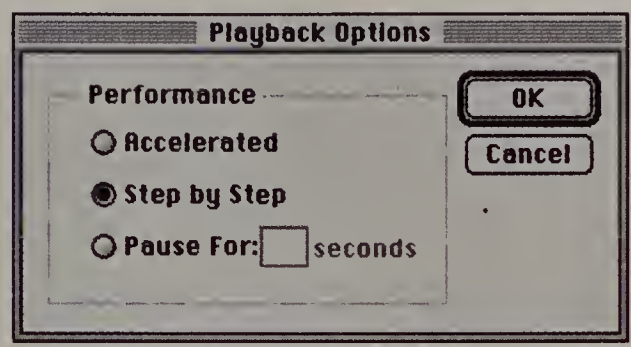


5 When the frame was complete, Monroy activated a layer with an image of a globe. He then began turning on layers containing images of the man's head at increasing opacity—11, 25, 30, 40, and 100 percent—to create a fade-in effect as he had with the sky layers.

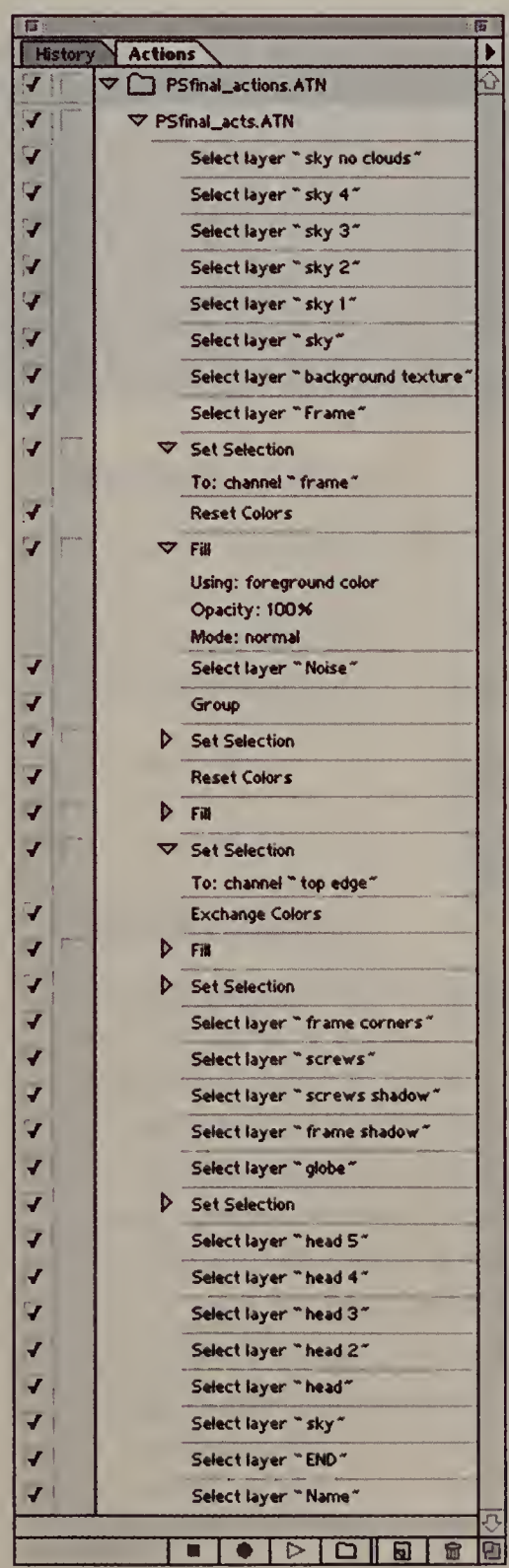
6 Monroy activated a layer that contained an image of the head with the globe mapped onto it—an image provided by photographer and artist Jeff Schewe.

7 Next he reselected the 100 percent–opaque sky image to hide the layer containing the original globe image. The final layer he turned on was a composite of the opaque sky and the globe-mapped head together, creating the beautiful finale seen here.

8 Photoshop 5's Playback Options palette gave Monroy several ways to show the presentation: Accelerated displays only the final image, Step by Step shows each action in sequence, and Pause For pauses each action on screen.



9 Here is Monroy's finished set of actions. Clicking the play button (at bottom) starts the series and gets the "movie" rolling.



At the start of Monroy's Actions sequence, the sky layers are turned on one by one to create the illusion of a fade-in.

Next, the metallic-like frame forms: the frame channel loads into the "frame" layer, and the "noise" layer is turned on and grouped with the frame layer. Then the "bottom edge" and "top edge" channels load and fill with color to create the frame bevels.

The layers with the frame's details are turned on next.

Then the globe image layer is activated.

The head layers of increasing opacity are turned on in succession, and then the layer with the final composite image is activated and ends the "movie."

Macworld's Ultimate Gaming Guide

Attention, all Mac gamers!

Macworld is bringing you complete and in-depth coverage of Mac games and more—just in time for your holiday gift giving (or getting!). Macworld's special gaming coverage will provide all Mac gamers, from novice to expert, with the quintessential "how to" for building the perfect gaming machine.

In this issue:

This month check out input devices—Macworld editors review joysticks, game pads, and driving wheels. In Game Room several gaming industry insiders share their ideas for gaming on the Mac.

Macworld

December:

December features multiplayer gaming. Get yourself set up to play a game head-to-head, over an office network, or over the Internet. Macworld editors share their hints and tips for playing popular multiplayer games and the "rules of engagement"—online gaming etiquette. In Game Room it's the notorious Game Hall of Shame! Macworld will look at some notable promises that game vendors have broken—including products that never shipped for the Mac and products that didn't live up to their hype.

January:

January will feature 3-D graphics—a lab-based feature testing the latest crop of 3-D accelerators. In Game Room a Macworld editor attempts to play PC games on a Mac (the heartache and headache!)

Macworld LAB TEST

February:

February will feature the official Game Guide—a comprehensive round-up of currently shipping mac games. And in Game Room you will find sneak peaks of soon-to-ship games we can't wait to play!

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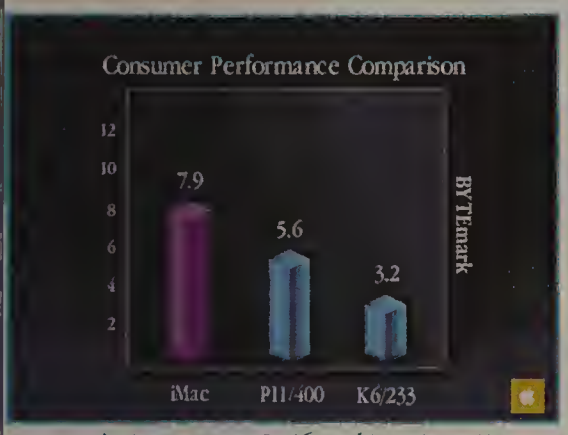

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G3 PowerBooks

Item #	Screen	Processor Speed	Cache	Hard Drive	RAM	Modular FDD	S-Video	Modem	ONLY	Lease*	Ext. Service**
#56710	12.1" FSTN	233MHz	512K	2GB	32MB	–	–	–	**$1999**	$74/mo.	$189.98
#19056	14.1" LCD	233MHz	512K	2GB	32MB	Yes	–	56K	**$2799**	$104/mo	$219.98
#19057	14.1" LCD	266MHz	1MB	4GB	64MB	Yes	–	56K	**$3499**	$129/mo	$279.98
#19058	14.1" TFT	300MHz	1MB	8GB	64MB	Yes	Yes	56K	**$4999**	$184/mo	$329.98

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#56973	Adara Megastar II	$1,299.00
#08472	Adara StarLight Plus! 308it SCSI Flatbed	$79.98
#56974	Adara Twinstar 1000	$1,999.00
#02135	AGFA Arcus II w/Photo Shop 4.0	$1,219.00
#40938	AGFA SnapScan 600 ArtLine Flat8ed	$429.98
#38049	Arcus II Solo w/Trans Adpt	$999.98
#31562	Minolta Dimage Scan Dual Film w/o SCSI	$499.98*
	After Mfr. Mail-in Rebate. While Supplies Last.	
#08532	Minolta Dimage Scan Multi Film w/SCSI	$2,498
#08586	Epson Expression 636 Artist 2 w/Painter 5	$699.98
#82671	Epson Expression 636 Executive	$599.98
#08589	Epson Expression 636 Pro 2 w/Painter 5	$1,099.00
#76971	HP ScanJet 6100C	$749.98
#58443	Microtek Scanmaker 5	$2,499.00
#72398	Microtek Scanmaker 6400XL	$949.98
#72394	Microtek ScanMaker E3 Plus	$124.98
#78922	Microtek ScanMaker III w/TMA	$1,219.00
#53990	Microtek Scanmaker V310 Flatbed	$79.98*
	After $30 Mfr. Mail-in Rebate. While Supplies Last.	
#72396	Microtek ScanMaker V600	$129.98
#00758	Microtek ScanMaker X6	$174.98
#76189	Minolta QuickScan35	$899.98
#08626	Nikon Coolscan III LS-30 film Scanner	$999.98
#60473	Nikon SuperCoolScan LS-2000	$1,899.00
#00538	Olympus ES-10 SCSI Film Scanner	$499.98
#58434	Umax Powerlook II w/PhotoshopLE	$895.00*
	*After $200 Mfr. Mail-in Rebate. While Supplies Last.	
#77119	Umax Astra 1200S w/Photo Dlx/PgMngr	$199.98*
	*After $50 Mfr. Mail-in Rebate. While Supplies Last.	
#58433	Umax Astra 1200s w/PhotoshopLE	$249.98*
	*After $50 Mfr. Mail-in Rebate. While Supplies Last.	
#58475	Umax Astra 1220S SCSI Flatbed	$149.98*
	*After $30 Mfr. Mail-in Rebate. While Supplies Last.	
#18369	Umax Astra 2400s	$499.98
#58415	Umax Mirage II SE	$2,295.00
	*After $300 Mfr. Trade-in Mfr.Rebate. Offer valid 10/1-10/31/98	

Digital Cameras

#52813	AGFA e-Photo 1280 Camera	$649.98
#08571	AGFA e-Photo 1680 Camera	$879.98
#82669	AGFA e-Photo 307 Camera	$249.98
#53943	AGFA e-Photo 780 Camera 1024x768dpi	$398.98
#73282	Kodak DC220 Camera	$799.98
#73283	Kodak DC260 Camera	$999.98
#31674	Minolta Dimage V Camera	$299.98*
	*After $100 Mfr. Mail-in Rebate. While Supplies Last.	
#60457	Nikon Coolpix 600 Digital Camera	$549.98
#60458	Nikon Coolpix 900 Camera	$829.98
#00795	Olympus D-340L Camera	$599.98
#53936	Olympus D-500L Camera	$699.98

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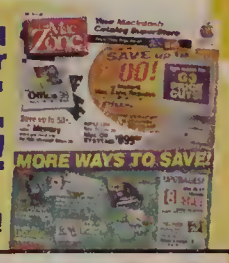

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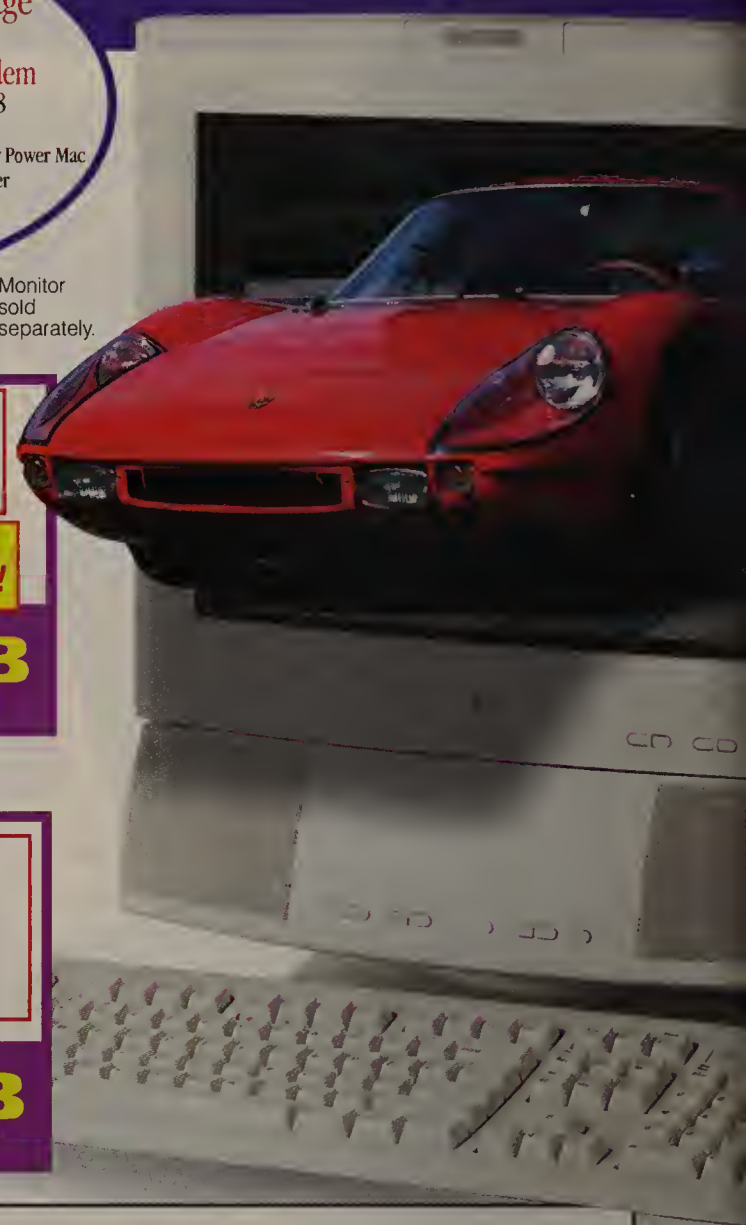

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Computer Model	Processor Speed	Hard Drive	RAM Standard/Max	CD-ROM	VRAM	Cache	Ethernet/ Modem	Zip Drive	Item #	ONLY	Lease*	Ext. Service**
G3/233 MT	G3/233MHz	4.0GB	32MB/768MB	24X	2MB	512K	10Base-T/ 56K	No	#77010	**$1549**	$58/mo.	$189.98
G3/266 DT	G3/266MHz	4.0GB	32MB/768MB	24X	2MB	512K	10Base-T	No	#19050	**$1599**	$59/mo.	$189.98
G3/300 DT	G3/300MHz	6.0GB	64MB/768MB	24X	2MB	512K	10Base-T	Yes	#19051	**$1999**	$74/mo.	$189.98
G3/300 MT	G3/300MHz	8.0GB	64MB/768MB	24X	6MB	1MB	10Base-T	Yes	#19054	**$2399**	$89/mo.	$219.98
G3/333 MT	G3/333MHz	9.0GB	128MB/768MB	24X	6MB	1MB	10Base-T	No	#19055	**$2999**	$111/mo.	$219.98

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#53947	Olympus D-600L Camera	$899.98
#72678	Sony Mavica 7 Adapter/Lens Set	$59.98
#201B0	Sony Mavica FD51Camera	$499.98
#20179	Sony Mavica FD71 10X 200M Camera	$699.98
#20177	Sony MaviCap FDR1 Camera	$299.98
#2017B	Sony MaviCap FDR3 Still Image Recorder	$499.98
#73291	Tiffen Circular Polarizer	$49.98
#73290	Tiffen CloseUp Lens Set	$59.98
#73292	Tiffen Star Filter Lens	$29.98
#732B7	Tiffen Super Wide Angle Lens	$89.98
#73294	Tiffen System Carrying Case	$49.98
#73289	Tiffen Telephoto Lens	$79.98
#732B8	Tiffen Wide Angle Lens	$79.98

Drives and Storage

#60503	AI Fireball 3.2GB Int SCSI HD 5400RPM	$259.98
#60504	AI Fireball 4.3GB Int SCSI HD 5400RPM	$289.98
#60505	AI Fireball 6.4GB Int SCSI HD 5400RPM	$429.98
#60506	AI Fireball 9.1GB Int SCSI HD 5400RPM	$759.98
#73796	AI Fireball ST 3.2GBEXT SCSI HD 5400RPM	$329.98
#73797	AI Fireball ST 4.3GBEXT SCSI HD 5400RPM	$389.98
#7379B	AI Fireball ST 6.4GBEXT SCSI HD 5400RPM	$509.98
#60502	AI Seagate 2.1GB Int SCSI HD 5400RPM	$229.98
#73795	AI Seagate 2.1GB EXT SCSI HD 5400RPM	$299.98
#70477	Apple 3.0GB External SCSI Hard Drive	$379.98
#70479	Apple 6.4GB External SCSI Hard Drive	$549.98
#704B0	Apple 9.0GB External SCSI Hard Drive	$939.98
#14B15	BellStor 18.2GB AtlasIII LVD SCSI Ext HD	$1,629.00
#14B13	BellStor 18.2GB AtlasIII UW/SCSI Ext HD	$1,559.00
#14B04	BellStor 2.1GB Fireball SE SCSI Ext HD	$309.98
#14B05	BellStor 3.2GB Fireball SE SCSI Ext HD	$349.98
#14B06	BellStor 4.3GB Fireball SE SCSI Ext HD	$385.98
#14B09	BellStor 4.5GB Viking SCSI Ext HD	$345.98
#14B17	BellStor 4.5GB VikingII LVD SCSI Ext HD	$605.98
#14B16	BellStor 4.5GB VikingII UW/SCSI Ext HD	$575.98
#14B07	BellStor 6.4GB Fireball SE SCSI Ext HD	$485.98
#14B0B	BellStor 8.4GB Fireball SE SCSI Ext HD	$596.98
#14B10	BellStor 9.1GB Atlas III SCSI Ext HD	$929.98
#14B19	BellStor 9.1GB VikingII LVD SCSI Ext HD	$869.98
#14B1B	BellStor 9.1GB VikingII UW/SCSI Ext HD	$839.98
#15106	Fujitsu DynaMD 640AI Int ATAPI Drive	$299.98
#57B46	Fujitsu DynaMD 640SE Ext Drive	$349.98
#57B47	Fujitsu DynaMD 640SZI Int Drive	$349.98
#76B69	Hi-Val 12X SCSI CD-RDM Drive Ext	$119.98
#73725	Hi-Val 24x SCSI CD-RDM Drive Ext Kit	$159.98
#60536	Hi-Val 32X SCSI CD-Rom External Kit	$189.98
#73B39	Iomega Jaz 1GB Ext w/Cart Refurbished	$199.95
#25659	Iomega Jaz 1GB External Drive	$299.95
#73771	Iomega Jaz 1GB Int w/Cart Refurbished	$199.95
#2565B	Iomega Jaz 1GB SCSI Insider Drive	$279.95
#51755	Iomega Jaz 2GB Ext SCSI w/2GB Cartridge	$399.98
#51756	Iomega Jaz 2GB Int SCSI w/2GB Cartridge	$499.95
#91B25	Iomega Zip 100 SCSI Ext.	$119.95
#70735	Iomega Zip 100 SCSI Insider Platinum Drv	$119.95
#60559	La Cie 18GB IBM XP Wide SCSI Ext HD	$1,399.00
#60549	La Cie 18GB IBM XP Wide SCSI Int HD	$1,299.00
#30840	La Cie 2.1GB External SCSI HD	$299.98
#30852	La Cie 2.1GB Internal SCSI HD	$219.98
#73B14	La Cie 2x6 CD-RW External w/Toast	$559.98
#7B426	La Cie 2x6 Ext CDR Sony w/Toast	$399.98
#70445	La Cie 3.2GB External SCSI HD	$319.98
#70440	La Cie 3.2GB Internal SCSI HD	$239.98
#70446	La Cie 4.3GB External SCSI HD	$369.98
#70441	La Cie 4.3GB Internal SCSI HD	$279.98
#70447	La Cie 4.5GB External SCSI HD	$409.98
#70442	La Cie 4.5GB Internal SCSI HD	$329.98
#09400	La Cie 4.5GB UW SCSI Int HardDrive	$379.98
#12166	La Cie 4x12 Ext SCSI CDR Recorder d2	$539.98
#60513	La Cie 4x6x2 Ext SCSI CDRW w/Toast	$529.98
#70409	La Cie 4xB External SCSI CD-Recorder	$499.98
#7044B	La Cie 6.4GB External SCSI HD	$499.98
#70443	La Cie 6.4GB Internal SCSI HD	$429.98
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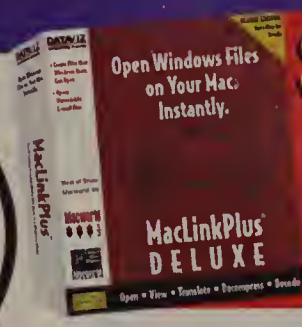

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	SDRAM TYPE NEEDED	ITEM #	ONLY
	16MB SDRAM	#54480	$39.98
	32MB SDRAM	#54481	$49.98
	64MB SDRAM	#54482	$79.98
	128MB SDRAM	#54483	$249.98
VRAM	2MB SGRAM Upgrade	#53736	$22.98
	4MB SGRAM Upgrade	#53737	$39.98

#60547	La Cie 9.1G8 I8M ES Wide SCSI Int HD	$539.98
#70444	La Cie 9.1G8 Internal SCSI HD	$539.98
#86340	La Cie DLT 4000 40G8 Ext Tape Drive	$3,179.00
#12192	La Cie DLT 7000 70G8 Ext Tape Drive	$5,839.00
#73715	La Cie SDT 9000 DAT DDS-3 12G8 Tape Drv	$1,249.00
#70433	La Cie SDT-5000 DAT DDS-2 8G8 Tape Drv	$749.98
#59750	Maxoptix 2.6G8 Ext SCSI MD Drive	$1,329.00
#00482	Maxoptix 2.6G8 Int SCSI MO Drive	$1,279.00
#59765	Maxoptix 640se 3.5" 640M8 Ext MO Drive	$569.98
#59764	Maxoptix CD-Max 2x6 CD-RW Ext Drive	$579.98

Storage Media

#84440	EZFlyer 230 Mac Cartridge 10-Pack	$199.98
#84438	EZFlyer 230 Mac Cartridge 3-Pack	$59.98
#84439	EZFlyer 230 Mac Cartridge 5-Pack	$99.98
#84437	EZFlyer 230 Mac Cartridge Single	$24.98
#77370	Fuji 3.5" MF2HD 10PK Mac w/$3 Rebate	$4.98
#84111	Fuji 3.5" MF2HD 50Pk Mac w/$15 Rebate	$22.98
#79899	Fuji 3.5" MF2HD Mac 30-Pack w/$9 Reb.	$13.98
#59776	Fuji CD-R 74min 10-Pack w/$20 Rebate	$29.98
#91906	Fuji CD-R 74min 3-Pack w/$5 Rebate	$8.49
#47562	Fuji CD-R 74min 5-Pack w/$10 Rebate	$14.98
#91952	Fuji CD-R 74min Single	$1.98
#59704	Fuji CD-ReWritable Single	$17.98
#59775	Fuji CD-RW 3Pk w/$10 Rebate	$55.98
#91987	Fuji DG120M 4mm Data Grade Tape 4G8	$8.98
#42230	Fuji DG125M 4mm Data Grade Tape 12G8	$25.98
#05716	Fuji DG60M 4mm Data Grade Tape 1.3G8	$4.69
#05717	Fuji DG90M 4mm Data Grade Tape 1.95G8	$4.89
#59784	Fuji Mac Zip Multiclr 5Pk w/$10 Rebate	$69.98
#05718	Fuji QG112M 8mm Data Grade Tape 2.5G8	$4.68
#84110	Fuji DG160M 8mm Data Grade Tape	$10.29
#73817	Fujitsu 640M8 Unformatted 3.5 Media 5Pk	$79.98
#73836	Jaz 2G8 Cart Preformatted 3-Pack f/Mac	$299.95
#73835	Jaz 2G8 Cart Preformatted f/Mac	$124.95
#97983	Sony 3.5 Flpy Disk 2HD Mac Form. 10 PK	$3.39
#06404	Sony 3.5" 128M8 Rewrite M.O. 512b/s	$7.98
#01140	Sony 3.5" 230M8 M.D. 512b/s	$10.98
#83289	Sony 4X 5.25" MD Disk 2.6G8	$55.98
#14391	Sony 5.25" Rewrite 1.2G8 M.O. 512b/s	$42.98
#06413	Sony 5.25" Rewrite 650M8 M.D. 1024b/s	$36.98
#75795	Sony 8mm AIT Cart	$88.29
#16200	Sony CD-R 10-Pack w/$20 Rebate	$25.98
#59712	Sony CD-ReWritable Single	$18.98
#51726	Sony DG120P 4mm Data Cart 4G8 DDS-2	$11.29
#05924	Sony DG60M 4mm Data Cart 1.3G8	$5.48
#14358	Sony DG90M 4mm Data Cart 2G8	$5.59
#14361	Sony DG112M 8mm Data Cart D8 2.5/5 G8	$5.39
#21440	Sony DGD160M 8mm Data Cart 7/14G8	$11.98
#27638	Sony Travan TR-3 Cartridge 2G8/4G8	$19.98

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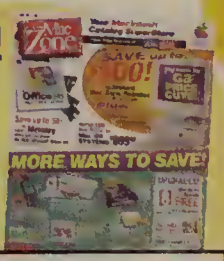

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#17964 64MB EDGE iMac Memory Module $249.98

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#83366	SyJet Mac Cartridge 3-Pack	$199.98
#83365	SyJet Mac Cartridge Single	$79.98
#06028	Verbatim 128M8 3.5" M.O. Mac Formatted	$7.39
#06938	Verbatim 128M8 3.5" R/W 512 8ytes/Sec.	$7.39
#91979	Verbatim 230M8 3.5" M.O. Mac Formatted	$11.39
#01169	Verbatim 230M8 3.5" MO Disk Unformtd	$11.39
#97982	Verbatim 5.25" 1.3G8 Rewrite Opt Cart	$39.98
#84976	Verbatim 640M8 3.5" MO 2048b/s	$25.39
#47823	Verbatim CD-Rewritable Optical Disc	$15.98
#81829	Verbatim DataLife Plus CD-R 74min	$1.89
#86769	Verbatim DataLife Plus CD-R 74min 5Pk	$8.98
#14796	Zip 100M8 Mac-Formatted Media (8lue)	$19.95
#14795	Zip 100M8 Mac-Formatted Media (Gray)	$19.95
#14798	Zip 100M8 Mac-Formatted Media (Green)	$19.95
#14797	Zip 100M8 Mac-Formatted Media (Red)	$19.95
#14799	Zip 100M8 Mac-Formatted Media (Yellow)	$19.95

Input Devices

#93374	Apple Design Keyboard M2891LL/A	$84.98
#94469	Apple Desktop 8us Mouse II	$79.98
#94461	Apple Extended Keyboard II	$154.98
#59821	CalComp Creation Station 4x5 w/$30 Reb	$129.98
#20157	CalComp CreationStation Pro 12x18	$599.98
#20085	CalComp CreationStation Pro 6x9	$289.98
#85553	Easy Touch Extended Keyboard	$39.98
#89379	Kensington Mouse 1.0	$59.98
#87464	Kensington Mouse In A 8ox	$39.98
#78420	Kensington Orbit	$69.98
#93628	Kensington Thinking Mouse AD8	$69.98
#75111	Macally Extended Keyboard w/ Touchpad	$72.98
#75112	Macally Two 8utton Programmable Mouse	$29.98
#85591	Nu-Form Basic Keyboard	$49.98
#90766	Tru-Form Extended Keyboard	$69.98
#87483	Turbomouse 5.0	$99.98
#90643	Wacom ArtPad II (AD8) w/Erase UltraPen	$139.98
#72019	Wacom ArtZ II 12 x 12 w/Painter 5	$599.98
#90201	Wacom Artz II 12x18(Serial)w/Erase UltraPen	$699.98
#72018	Wacom ArtZ II 6 x 8/Painter 5 8undle	$499.98

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#00923	APC 8ack UPS Pro 280 (8lack)	$149.98
#00925	APC 8ack UPS Pro 420 8lack	$209.98
#00926	APC 8ack UPS Pro 650 (8lack)	$269.98
#00933	APC 8ack-UPS 200	$89.98
#00931	APC 8ack-UPS 300	$99.98
#00930	APC 8ack-UPS 500	$149.98
#00934	APC 8ack-UPS Office	$99.98
#85836	APC 8ack-UPS Pro 650 for Mac	$285.98
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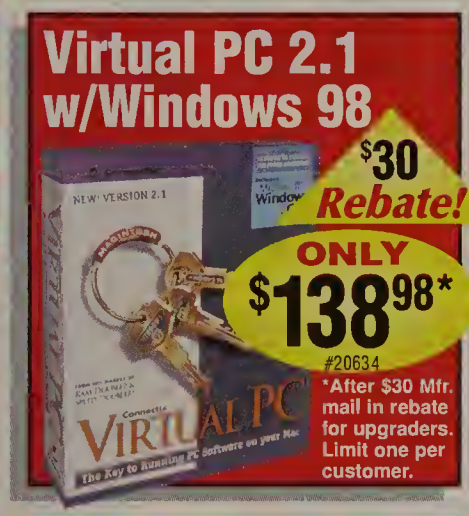

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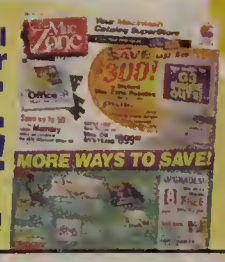

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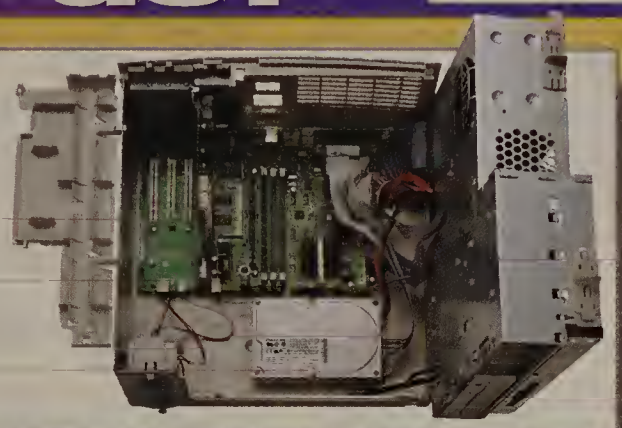

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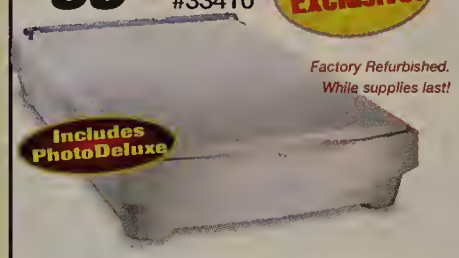

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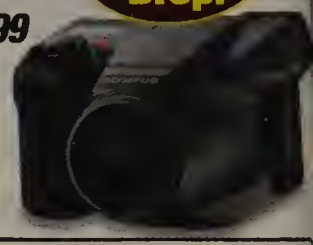

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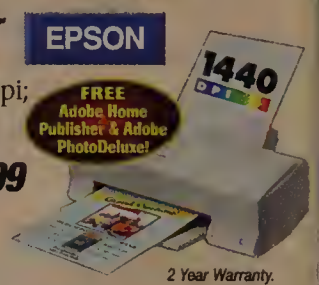

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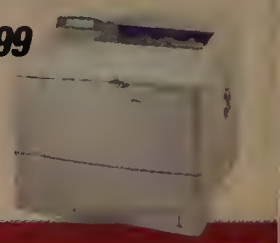

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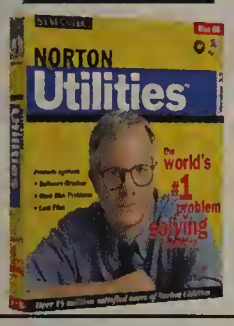

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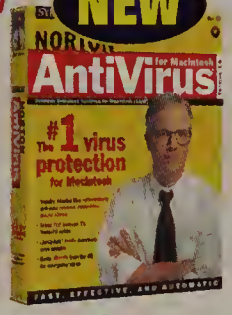

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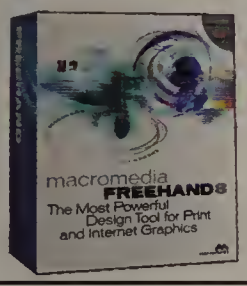

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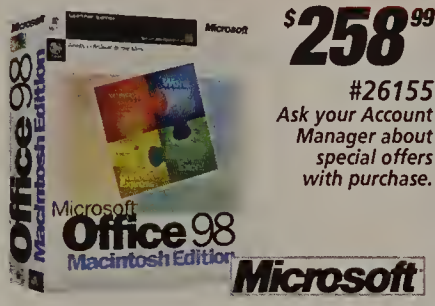

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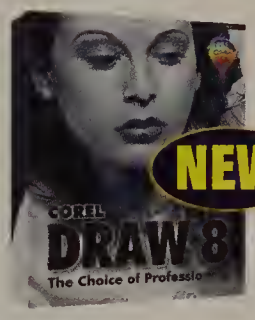

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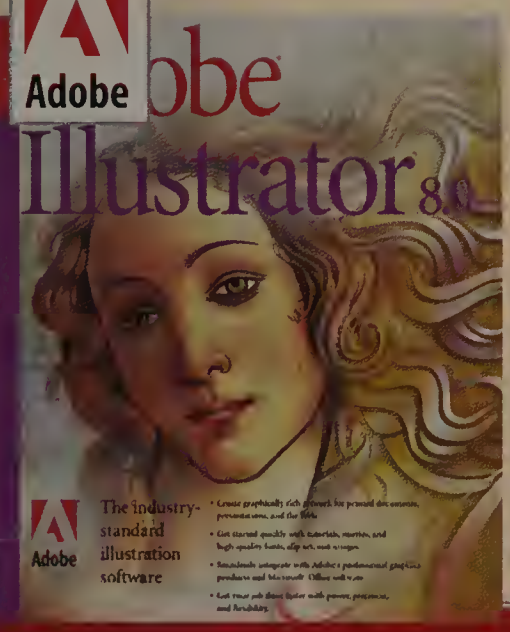

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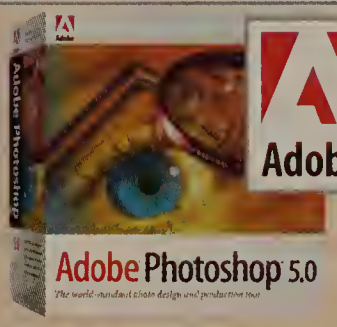

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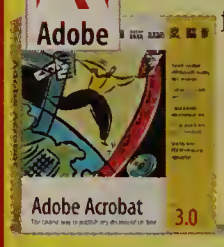

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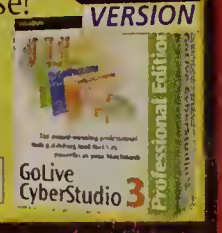

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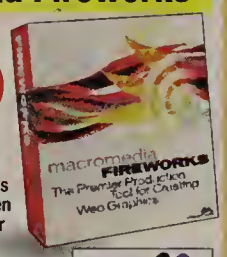

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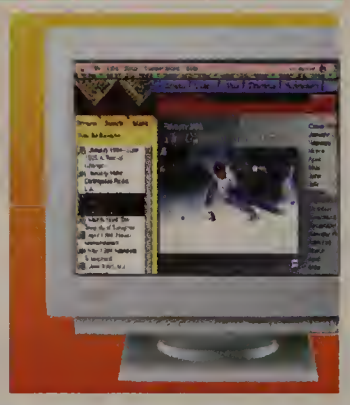

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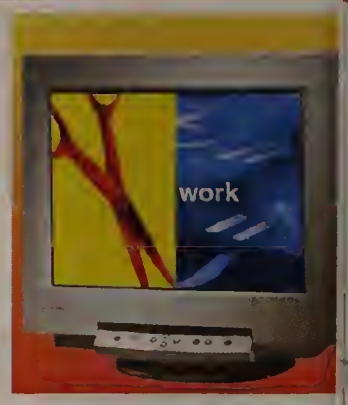

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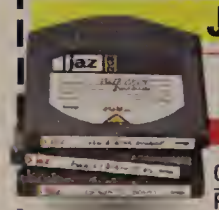

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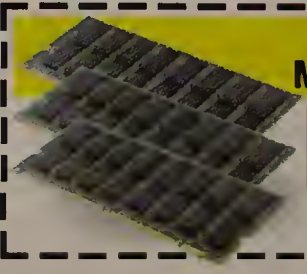

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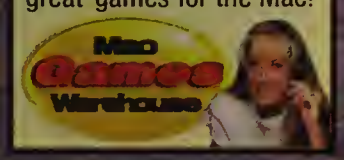

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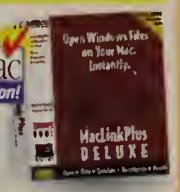

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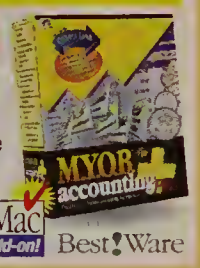

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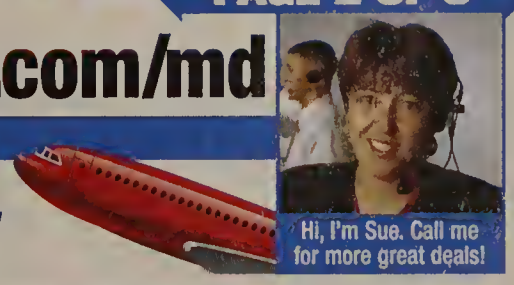

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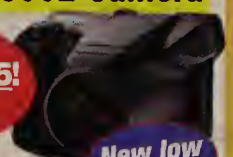

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NEW! MACINTOSH SERVER G3

- 300MHz PowerPC G3 processor
- 64MB RAM (768MB max.)
- 4.0GB ultra-wide SCSI HD • 24X CD
- Built-in 100Base-T Ethernet

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Item # CPU1202

Macintosh Server G3/333MHz: 128MB RAM/Two 9.0GB ultra-wide SCSI HDs/100 Base-T Ethernet • 24X CD
Item # CPU1203 ..... Only $4599!

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- Orders for "in-stock" items placed on weekdays up until 12:00 midnight (E), 10:00 pm (E) for Internet orders, ship same day for overnight delivery (barring system failure, etc.). We anticipate being able to ship "out-of-stock" items within 30 days.
- All items we sell come with the MacWAREHOUSE 30-Day Guarantee Against Defects. Call our Customer Service Department at 1-800-925-6227 for a Return Merchandise Authorization (RMA) number within 30 days of the original invoice date. All returns are subject to the following: 1. All products must be returned in original packaging. 2. Shipping and handling charges are not refundable. 3. Software and consumables are not refundable unless returned unopened in original packaging with documentation. 4. Custom orders and cables are not refundable. 5. Products designated as "all sales final" are not refundable. If your Apple hardware is defective you must call Apple Computer, Inc. directly at 1-800-SOS-APPL (1-800-767-2775). Apple Computer, Inc. will repair or replace products at its sole discretion. If you do return Apple hardware to MacWAREHOUSE, you will be assessed a 15% restocking fee which will be charged to your account.

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We accept these major credit cards.

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Power Mac G3s as low as $1599!

Power Mac G3/266MHz desktop. See left page for details.

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Price slashed on

PowerBook G3

now only

$1999!

was ~~$2299~~

ASK FOR ITEM # CPU1162.

Hi, I'm Kathleen. Call me about our PowerBook deals!

- 233MHz PowerPC G3 processor
- 32MB SDRAM
- 2.0GB hard drive
- 20X CD-ROM drive
- 10Base-T Ethernet
- 12.1" dual-scan color display

Floppy drive sold separately. Ask for item # DRI2661

KENSINGTON DELUXE NOTEBOOK TRAVELLER

Only $49!

Ask for item # ACC0676.

Holds a portable computer, a small printer, and accessories.

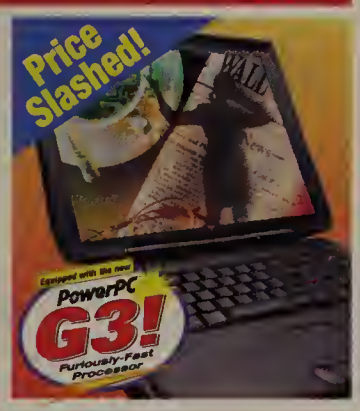
APPLE POWERBOOK G3/233MHZ

- 233MHz PowerPC G3 processor
- 32MB SDRAM
- 2.0GB hard drive
- 20X CD-ROM drive
- 10Base-T Ethernet
- 56K modem
- 12.1" dual-scan color display

was ~~$2579~~

Now only $2199!

Item # CPU1163



NEW! APPLE POWERBOOK G3/233MHZ

- 233MHz PowerPC G3 processor
- 32MB SDRAM
- 2.0GB IDE hard drive
- 20X CD-ROM drive • 56K modem
- 10Base-T Ethernet
- 512K Backside Level-2 cache
- 14.1" active-matrix color display

Only $2799!

Item # CPU1238

NEW! APPLE POWERBOOK G3/266MHZ

- 266MHz PowerPC G3 processor
- 64MB SDRAM
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- 10Base-T Ethernet
- 1MB Backside Level-2 cache
- 14.1" active-matrix color display

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- 300MHz PowerPC G3 processor
- 64MB SDRAM
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- 10Base-T Ethernet
- 1MB Backside Level-2 cache
- 14.1" active-matrix color display

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Item # CPU1240

PowerBook G3 Accessories

NEW! VST Zip 100 Drive

Internal Only **$249.95!** DRI2692

For PowerBook G3 Series

- Seamless user interface - behaves just like a floppy
- Bootable, Mac OS 8 boot disk provided
- Includes Iomega Tools

56K V.90 Fax/Modem PC Card

Only **$189.99!** DMD3824

- K56Flex and V.90 technology cuts Web page downloading time almost in half!

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PowerBook G3 Memory Upgrades

Call for our lowest prices and full selection!

- SDRAM DIMM

Fastest memory ever for your G3 Powerbook!

Apple PowerBook G3 Floppy Drive

Only **$109.95!** DRI2661

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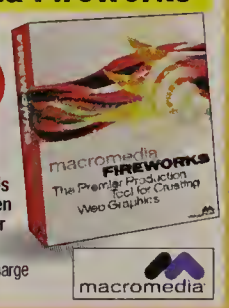

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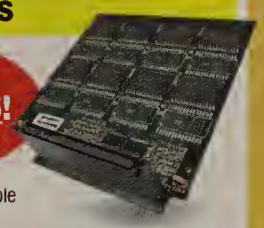
macromedia

PowerBook 32MB Memory Upgrades

As low as $159.95!



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32MB for PowerBook 1400: Item # CHP0498, $179.95
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• Includes MacPac translation software
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• 8MB compact flash
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Global Village 56K V.90 Modem

Only $149.99! DMD3467

• Compliant with both V.90 and K56Flex technology
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GLOBAL VILLAGE

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Apple Power Mac G3 Prices Slashed!

As low as $1249!* was $1499 Item # RCPU0956

Equipped with the new PowerPC G3! Furiously-Fast Processor

Factory Reconditioned

APPLE POWER MAC G3 DESKTOP

• 233MHz PowerPC G3 processor • 32MB RAM (192MB max.)
• 4.0GB hard drive • 24X CD-ROM drive • 10Base-T Ethernet

*Reconditioned system. Reconditioned computers may not include original application software. 90 days parts and labor warranty. All sales final. While supplies last.

Many other reconditioned Power Mac G3s available. Call for details.

Monitors sold separately.

APPLE POWER MAC G3 MINITOWER

• 233MHz PowerPC G3 processor
• 32MB RAM (exp. 384MB) • 4.0GB hard drive
• 24X CD-ROM • 56K modem • 10Base-T Ethernet

Item # RCPU1105 was $1699: NOW ONLY $1399!*

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APPLE POWERBOOK DUO 230

• 33MHz 68030 processor • 12MB RAM
• 120MB HD • 14.4Kbps modem
• 9" grayscale Supertwist display
• ClarisWorks 3.0

Only $299!†

Item # RCPU1188

RCPU1195: PowerBook 180: 33MHz 68030 processor, 8MB RAM, 120MB HD, 14.4Kbps modem, 10" black & white active-matrix display: .....only $599†

†Reconditioned system. Reconditioned computers may not include original application software. 90 days parts and labor warranty. All sales final. While supplies last.

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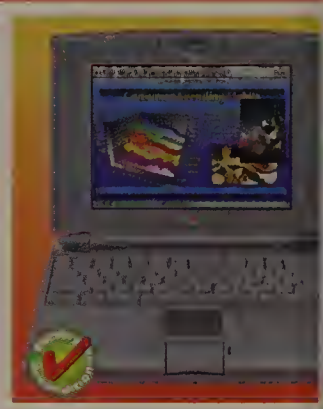
• 25MHz 68040 processor
• 20MB RAM • 240MB HD
• 9.5" dual-scan color display
• 19.2Kbps modem

Only $699!†

Item # RCPU1107

RCPU1196: PowerBook 540c: 33MHz 68LC040 processor, 12MB RAM, 240MB HD, 19.2Kbps modem, 9.5" color active-matrix display, ClarisWorks 3.0: .....only $799†

†Reconditioned system. Reconditioned computers may not include original application software. 90 days parts and labor warranty. All sales final. While supplies last.



HITACHI 17" MONITOR

HITACHI

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• Resolutions up to 1152 x 870 @ 75Hz
• .28mm dot pitch
• Manufacturer's 3-year warranty

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SONY

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iomega

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APC

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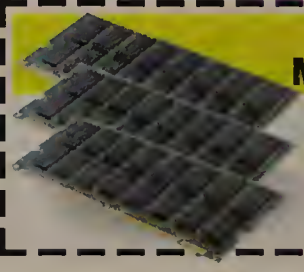
Full-time surge protection and instantaneous battery back-up to protect your equipment against brownouts, overvoltages, and blackouts.

Power Mac G3 Memory Upgrades



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• Full selection available

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See below for details.

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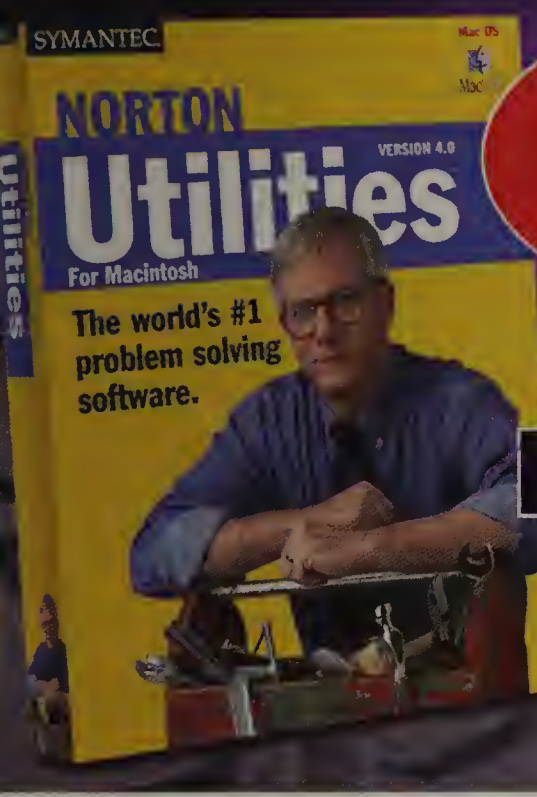
NEW VERSION! Norton Utilities 4.0 for Macintosh



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NEW FEATURES:

- One-button fix and enhanced error reporting with Norton Disk Doctor
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*Price after publisher's $50 mail-in upgrade rebate. Price before rebate is $99.95. Proof of ownership of previous version of Norton Utilities for Macintosh required. Limit one per customer. Rebate expires 30 days after purchase date. Copy of invoice required.

NORTON ANTIVIRUS 5.0 FOR MAC UPGRADE ONLY $29.95!** after rebate UTI1332

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- 1440 x 720dpi
- 6ppm black/ 5ppm color
- USB connectivity

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As low as $499.95!* IN7214

*Price for Sony FD51

- High speed 2x disk drive

SONY

Sony FD71 Digital Camera (shown).

- 10X zoom lens • Whole disk copy • 640 x 480 max.
- 2.5" color LCD w/Solar Window™ Panel • E-mail mode

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- 4-button design
- MouseWorks software included

With FREE* CE Software's Instant QuickKeys!

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1.0GB Jaz Cartridges

iomega

Get 20 CD-Rs FREE!

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- Your total database solution
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- 1.3 mega pixel
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UMAX

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Kodak DC210 Digital Camera

Kodak

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was: ~~$699.95~~

- 2x zoom lens
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- 1.8" color LCD display

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Adobe

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Color!

- 680 x 480dpi resolution
- 24-bit color camera
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Connectix

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Six great reasons to get complete system coverage:

1. **Toll-Free Technical Help** available 24 hours a day!
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Consult the chart below to see which warranty best fits your needs:

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Call your Account Manager for details on orders over $3,000.		

Call your sales representative today!

*Note: This promotion is not a service agreement, but an outline of coverage available through DFS. Please call Micro Warehouse, Inc. for information and read the complete Service Agreement from DFS for exact coverages, terms, and conditions. On-site service begins after manufacturer's warranty expires. Plan not available on international or Florida orders.

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Adobe

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Adobe Illustrator 8.0

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With the new **SCATTER BRUSH** you control the size, spacing, relative dispersion and more, giving your paths a truly freeform look and feel.

LOOK!

8 Great Reasons to Upgrade!

1. **Art Brush:** Save objects as Art brushes and apply to any path.
2. **Photo Crosshatch Filter:** Turn scanned photos into textured or crosshatched sketches.
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FREE!* Hot Door Transparency & Extensis Collect Pro 2.0 when you order Adobe Illustrator 8.0. Item # AAA0718.

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**Value based on individual products sold separately as of this magazine printing.

A $149 VALUE!**

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EPSON®

- 1440 x 720dpi
- 6ppm black/4ppm color

NEW LOW PRICE!

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Item # PR12126

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newertechnology

- 300MHz G3
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300MHz G3/1MB cache @ 150MHz DRI2574: $1349
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- Draw curved lines with Bézier tool and place text along curved lines!
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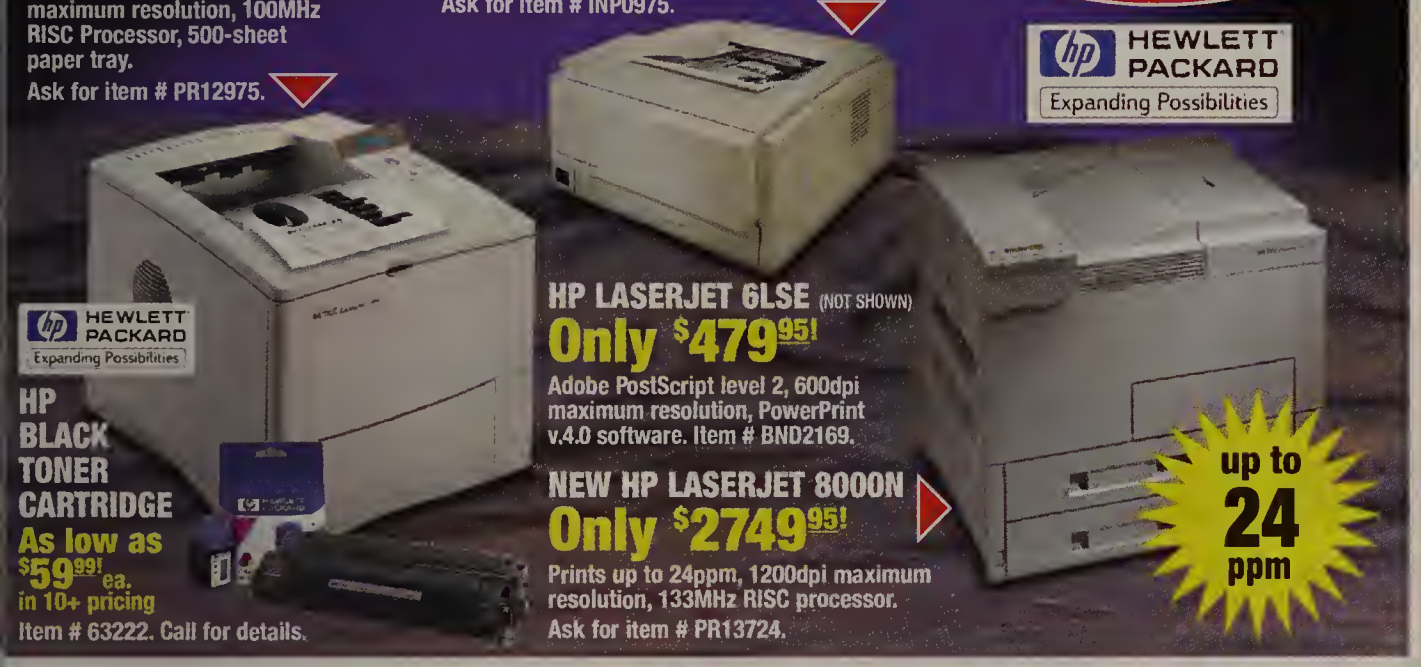

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NEW HP LASERJET 8000N
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up to 24 ppm

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ASANTÉ

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TDK. TDK Grey Cell Ltd.

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MITSUBISHI DIAMONDTRON CRT TECHNOLOGY

- 21" (19.7" viewable)
- Diamondtron CRT
- .28 Aperture Grill
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- Auto negotiation

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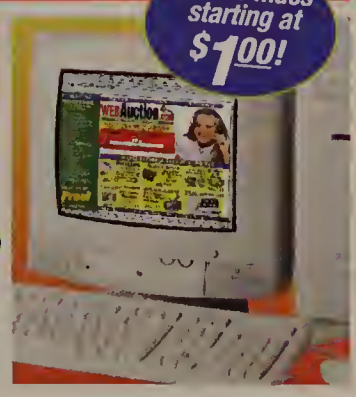

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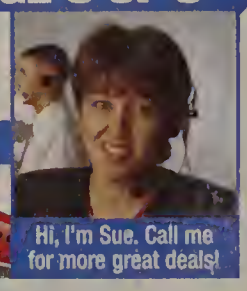

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DigitalGraphix

JAZ, Zip & CDR Drives

IOMega Jaz 1GB External	$199
IOMega Jaz 2GB External	$249
ZIP 100 External	$109
ZIP 100 Plus External	$158
Ricoh 2x/2x/6x Rewrite CDR with Toast/cart	$479
Teac 4x/12xCDR with Toast/cart	$499

MEDIA

IOMega Jaz 1GB Cartridges	$76
IOMega Jaz 2GB Cartridges	$89
ZIP 100 Cartridges (20+)	$9.50
CDR 74Min Recordable Media (10+)	$1.09
CDR 74Min Rewritable Media	$19

SyJet & SyQuest

SyJet 1.5GB External	$229
SyQuest 200MB External	$379

MEDIA

Syjet 1.5GB Cartridges	$49
Syquest 200MB Cartridges	$55
Syquest 88MB Cartridges	$33
Syquest 44MB Cartridges	$33

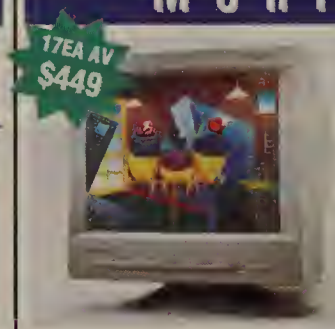
Tape Drives

SONY

- Fast Tape Backup
- Lowest Cost per MB

Sony 4GB - 5200 SCSI Ext	$669
Sony 8GB - 7000 SCSI DDS-2 Ext	$749
Sony 24GB - 9000 SCSI DDS-3 Ext	$1069
Sony AIT 50GB 8mm AIT Fast/Wide	$2739
20-40GB DLT Ext	$2869
35-70GB DLT Ext	$6329

Monitors



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EA771 17" Monitor

- 0.27MM Dot Pitch
- 1280 x 1024 Resolution
- Onview & Viewmatch Controls
- Integrated Stero Speakers
- Built-in Microphone Jacks
- 3 Year Warranty

Sony 100ES 15", 1280x1024, .25mm	$257
ViewSonic E771, 1024x768, .28mm	$349
ViewSonic EA 771AV, 1280x1024, .27mm	$449
ViewSonic GA771AV, 1280x1024, .25mm	$469
Sony 200ES 17", 1280x1024, .25mm	$439
Sony 200GS 17", 1280x1024, .25mm	$569
Sony 21" 500PS, 1600x1200, .30mm	$1359
ViewSonic V95 19", 1600x1280, .26mm	$569
ViewSonic G790 19", 1600x1200, .25mm	$639
ViewSonic G800 20", 1600x1280, .28mm	$929
ViewSonic P810 21", 1600x1200, .25mm	$1089
ViewSonic PT815 21", 1600x1200, .25mm	$1359
RasterOps MC801HR 21", 1600x1200, .22mm	$1299

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- Fast serial printing
- 7ppm black & white/color

Epson Stylus Color 3000, 17x22 Ink, 1440dpi	$1699
Epson Stylus Color 850, 8.5x11, Ink, 1440dpi	$359
HP LaserJet 8000N, 24ppm, 11x17, Enet	$2699
HP LaserJet 6MP	$874
GCC XL 600/20, 600dpi, 13x35, Enet, 20ppm	$1779
GCC XL 800/20, 800dpi, 13x35, Enet, 20ppm	$1959
GCC XL 1208SS, 1200dpi, 11x17, Enet, 8ppm	$3899
Tektronix Phase 360 Color Laser	$3399
Tektronix Phase 380 Color Laser, 11x17	$7699
Tektronix Phase 560F Color Laser	$4899

Scanners

AGFA

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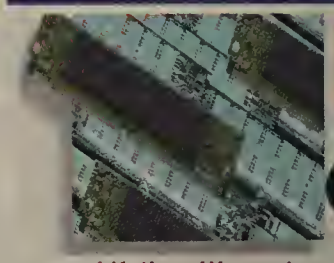
- 1200x600 optical Resolution
- 36-bit Color, PhotoShop Full
- Transparency adapter

LinoColor Jade Scanner 33bit	$449
LinoColor Saphire Ultra	$3269
Agfa SnapScan 310 30bit/Color It	$179
Agfa Arcus II/Transparency/Photoshop	$1199
Agfa DuoScan/Transparency/Photoshop	$2399
Epson Expression 636 Prof/Photoshop	$1079
Microtek Scanmaker III/Trans/Photoshop	$1099
Microtek Scanmaker V310 30bit/Color It	$48*
Microtek V600 30bit/ Color it	$99*
Microtek Scanmaker 6400XL	$919

Memory



G3 128MB Only $179

64MB Dimm Only $89

Lifetime Warranty

Size	5vDIMMS	SIMMS	G3 Dimm
16MB	$27	$27	$27
32MB	$48	$39	$41
64MB	$89	$149	$89
128MB	$249	NA	$179
256MB	$CALL	NA	$CALL

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Capacity for the Extraordinary

Quantum 9.1GB

- 7200 RPM
- 7.9ms Access Time
- SCSI Narrow

Description (All SCSI-3 Ultra)	Int	Ext
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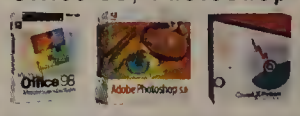
Quantum 4.3GB 5400 rpm Strautus 9ms	$269	$329
Quantum 4.5GB 7200 rpm Viking II 7.9ms	$439	$499
Quantum 6.4GB 5400 rpm Stratus 9ms	$349	$409
Quantum 8.4GB 5400 rpm Stratus 9ms	$469	$529
Quantum 9.1GB 7200 rpm Atlas II 7.9ms	$499	$559
Quantum 9.1GB 7200 rpm Atlas III 7.9ms	$699	$759
Quantum 18.2GB 7200 rpm Atlas III 7.8ms	$1199	$1259
Seagate 4.5GB 7200 rpm Medalist Pro 9.5ms	$299	$359
Seagate 9GB 7200 rpm Barracuda 9 7.9ms	$639	$699
Seagate 4.5GB 10000 rpm Cheetah 7.9ms	$489	$549
Seagate 9.1GB 10000 rpm Cheetah 7.9ms	$789	$849
Seagate 18.2GB 7200 rpm Barr18 7.6ms	$1169	$1229

Software

Office 98, PhotoShop V5.0, Quark V4.0



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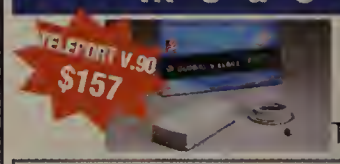
MicroSoft Office 98	$339
Quark Express v4.0	$679
Adobe illustrator v7.0	$349
Upgrade Adobe Illustrator v7.0	$109

Modems



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Teleport V.90 56K

Global Village Teleport V.90 56K	$157
Zoom Dual Mode V.90 56K	$119
Best Data V.90 56K	$109

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7200rpm 512k buffer 8ms Seek

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6.4GB $355 External: $425
8.4GB $475 External: $545
5400rpm 512k buffer 9.5ms Seek

Quantum Viking II

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7200rpm 1024k buffer 8ms Seek

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CD Recorders	EXTERNAL
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Panasonic CDR 7502 4X8X — 4 Speed Recorder/8 Speed Player Huge 2 MB Buffer	$415

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8 GB	CTD8000	60 MB/Min.	795
8 GB	Sony 7000	90 MB/Min.	975
24 GB	HP1554 DDS3	120 MB/Min.	1445
24 GB	Sony 9000 DD3	120 MB/Min.	1195
30 GB	DLT™ 2000XT	150 MB/Min.	1995
40 GB	DLT™ 4000	180 MB/Min.	2675
48 GB	HP1553 DDS2	60 MB/Min.	2485
50 GB	Sony AIT SDX 300C 8mm	120 MB/Min.	2975
70 GB	DLT™ 7000	600 MB/Min.	6375
144 GB	HP1559 DDS3	120 MB/Min.	3395
150 GB	DLT™ 2500XT	150 MB/Min.	4895
210 GB	DLT™2700XT	150 MB/Min.	6535
200 GB	DLT™ 4500	180 MB/Min.	6525
280 GB	DLT™4700	180 MB/Min.	7995

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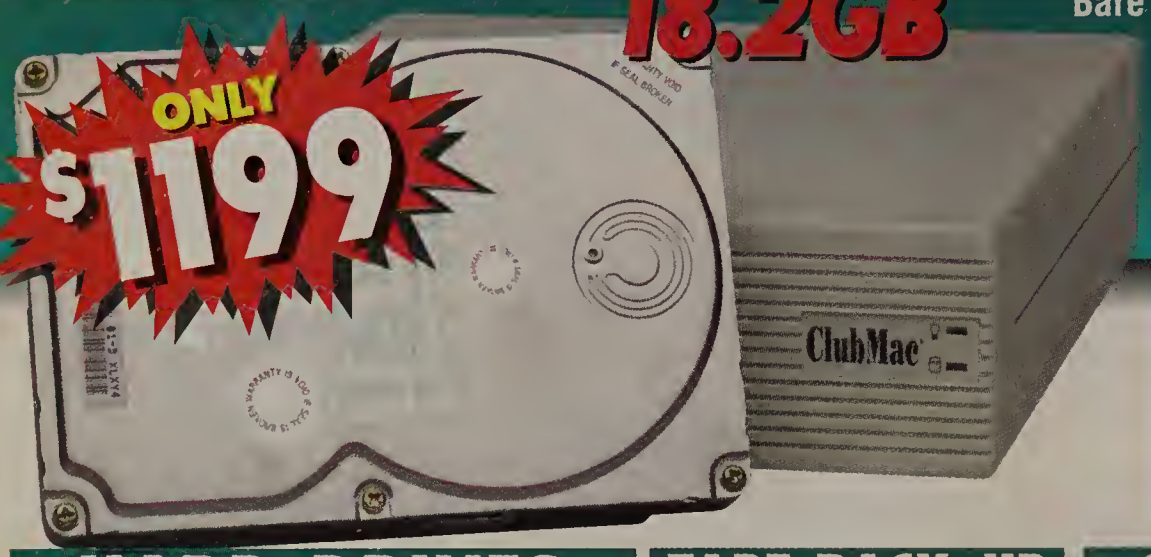

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Seagate BARRACUDA
Fast & Wide
18.2GB $1199
7200 RPM Bare

HARD DRIVES

Quantum

Quantum Stratus drives carry a 3 Year Warranty
Quantum Atlas & Viking drives carry a 5 Year Warranty

Description		Model	Access	RPM	Bare	Ext
Ultra SCSI-3						
2.1GB	Stratus SE	QM32160SES	10ms	5400	$209	$279
3.2GB	Stratus SE	QM33240SES	10ms	5400	$239	$309
4.3GB	Stratus SE	QM34320SES	10ms	5400	$279	$349
6.4GB	Stratus SE	QM36480SES	10ms	5400	$359	$429
8.4GB	Stratus SE	QM38420SES	10ms	5400	$479	$549
9.1GB	Atlas III	QM309100TDS	7.8ms	7200	$729	$799
18.2GB	Atlas III	QM318200TDS	7.8ms	7200	$1249	$1319
UltraWide SCSI-3						
4.5GB	Viking*	QM34550VKSC	8ms	7200	$199	$289
9.1GB	Atlas III	QM309100TDLW	7.8ms	7200	$779	$869
18.2GB	Atlas III	QM318200TDLW	7.8ms	7200	$1359	$1449
IDE Drives						
2.5GB	Fireball EL	QM302500ELA	10ms	5400	$139	----
5.1GB	Fireball EL	QM305100ELA	10ms	5400	$169	----
7.6GB	Fireball EL	QM307500ELA	10ms	5400	$259	----
10.2GB	Fireball EL	QM310200ELA	10ms	5400	$339	----

*80 pin SCA drive with 68 pin adapter

Seagate

Barracuda & Cheetah drives carry a 5 Year Warranty
Medalist drives carry a 3 Year Warranty

Ultra SCSI-3						
4.5GB	Medalist Pro	ST34520N	9.5ms	7200	$299	$369
6.5GB	Medalist Pro	ST36530N	9.5ms	7200	$399	$469
4.5GB	Medalist Pro	ST39140N	9.5ms	7200	$529	$599
9.1GB	Barracuda 9LP	ST39173N	7.1ms	7200	$649	$719
9.1GB	Cheetah	ST19101N	7.7ms	10000	$799	$869
18.2GB	Barracuda 18	ST118273N	7.1ms	7200	$1199	$1269
UltraWide SCSI-3						
9.1GB	Barracuda 9LPST39173W		7.1ms	7200	$649	$739
9.1GB	Cheetah 9LP	ST39102LW	12.2ms	10000	$799	$889
18.2GB	Barracuda 18	ST118273W	7.1ms	7200	$1199	$1289
18.2GB	Cheetah 18	ST118202LW	12.2ms	10000	$1429	$1519

IBM

IBM drives carry a 5 Year Warranty

UltraWide SCSI-3						
9.1GB	UltraStar 9ES	00K3990	7.5ms	7200	$599	$689
9.1GB	UltraStar 9ZX	59H6590	6.5ms	1000	$639	$729
18.2GB	UltraStar 18XP	59H6591	6.5ms	7200	$1199	$1289

THE CLUBMAC PACKAGE

ClubMac drives are preformatted and thoroughly tested. ClubMac external drives include a 30-Day Money Back Guarantee, Charismac Anubis Formatting Utility software, user's guide, 25/50-pin SCSI cable and power cord (wide drives include 68/68 pin SCSI cable). Bare drives include mounting screws only

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20-40GB DLT Drive w/ Retrospect	$2899
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SyQuest EZ Flyer 230MB 3.5"	$149
SyQuest SyJet 1.5GB 3.5"	$249*

*After $50 mail-in rebate. Ends 9/30/98.

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88MB	$38ea	$37.50ea	$37ea
200MB	$59ea	$58ea	$57ea
270MB	$43ea	$42ea	$41ea
EZ230MB	$27ea	$26.50ea	$26ea
1.5GB SyJet	$79ea	CALL	CALL

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Kodak DC200 w/LCD.....$489

Scanners

UMAX Astra 610s 300dpi ..$115.99
UMAX Astra 1220s 600dpi $237.99
UMAX PowerLook II $1239.99
Microtek V310 300dpi.....$79.99
Microtek 5canmaker V600 $199.99
Microtek Scanmaker 4 36-bit ..$689
Agfa Snapscan 310.....$195.99
Agfa Snapscan 600.....$385.67
Agfa Arcus II *Solo*.....$1199
Agfa Arcus II w/Photoshp.....$1399

G3 Processor Card Upgrades

RailGun From Bottom Line: (Best Value)
RailGun G3 233/512k 1.5/1 .....$389
RailGun G3 233/1MB 1.5/1 .....$499
RailGun G3 250/512k 1.5/1 .....$499
RailGun G3 300/150Mhz 1MB ..$789
RailGun G3 300/300Mhz 1MB ..$1399

Newer Technology G3 Upgrades:
MAXpowr G3 220/110Mhz 512k ..$619
MAXpowr G3 250/125Mhz 512k ..$729
MAXpowr G3 300/150Mhz 1MB $1229
MAXpowr G3 300/300Mhz 1MB $1929
MXpowr G3/240 1400PB $989
MAXpowr G3/240 For 6100 .....$699

PowerLogix G3 Upgrades
The "Little Screamer":
PowerForce G3 220/110Mhz 512k $389
PowerForce G3 300/150Mhz 1MB $789
PowerForce G3 300/300Mhz 1MB $989

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PowerLogix G3 366Mhz 1MB ....$CALL
PowerLogix G3 400Mhz 1MB ....$CALL
Newer G3 333Mhz 1MB.....$1299.99
Newer G3 366Mhz 1MB.....$1474.99
Newer G3 400Mhz 1MB.....$1939.99

Video/Display Cards 2D/3D

IX Micro ProREZ 4MB $289
IX Micro UltimateREZ 8MB....$539
IX Micro MacRocket 4MB $239
Vision 3D Lite 4MB $239
Vision 3D Lite 8MB $379
ATI Nexus 2D/3D 8MB $499
ATI Xclaim 3D w/Rage 4MB ..$169
ATI Xclaim 3D w/Rage 8MB ..$239
Microconversions 12 Vodoo II$348
Microconversions 8 Vodoo II $298

Fast 7200/10,000rpm Hard Drives

Quantum Atlas III 9GB $599
Quantum Atlas III 18GB $1219
Seagate Barracuda 9.1GB $695
Seagate Barracuda 18.2GB $1285
Seagate Cheetah LVD 9.1GB ..$789
IBM Ultrastar 9ES 4.55GB $339
IBM Ultrastar 9ES 9.1GB $599
IBM Ultrastar 9ZX 9.1GB $669
MAXTOR 10.2GB EIDE $379

SCSI Cards:
Jackhammer Fast/Wide $379
ATTO Express PCI Fast/Wide $269
ATTO Ultra2 PCI LVD $409
Initio w/Conley RAID Softwr $189

New Apple G3 System Pricing!

Desktop Systems
$1399 DT 233Mhz 32/4GB/24xCD
$1649 DT 266Mhz 32/4GB/Zip/24xCD

Mini-TowerSystems
$1879 G3 266Mhz 32MB RAM/4GB HD/Zip/24x/AV
G3 MT 333/64/8GB/CD/AV ..$2989
G3 DT 300 64/6GB/24x/Zip..$1989
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128MB SDRAM For All $219

New Apple G3 PowerBooks Are Here!

Select the best PowerBook for you!
From: $1989
233Mhz2GB/32/20x/12.1" $1989
233Mhz 2GB/32/20x/12.1" $2249
233Mhz 32/2GB/20x/13.3" $2599
233Mhz 32/2GB/20x/14.1" $2699
266Mhz 64/4GB/20x/14.1" $3489
300Mhz 64/8GB/DVD/14.1" $4989

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ULTRA SCSI

					Int	Ext
2111MB	5400rpm	512K	FB32100S	3yr	$199	$259
3228MB	5400rpm	512K	FB33200S	3yr	$235	$295
4310MB	5400rpm	512K	FB34300S	3yr	$269	$329
6448MB	5400rpm	512K	FB36400S	3yr	$350	$410
8455MB	5400rpm	512K	FB38400S	3yr	$455	$515
9100MB	7200rpm	1024K	XP309100S	5yr	$619	$679
18200MB	7200rpm	1024K	XP318200S	5yr	$1075	$1135

ULTRA WIDE SCSI

4550MB	7200rpm	512K	VK304550W	5yr	$295	$385
9100MB	7200rpm	512K	VK309100W	5yr	$499	$589

ULTRA 2 SCSI

4550MB	7200rpm	512K	VK304550LW	5yr	$305	$405
9100MB	7200rpm	512K	VK309100LW	5yr	$519	$619
9100MB	7200rpm	1024K	XP309100LW	5yr	$619	$719
18200MB	7200rpm	1024K	XP318200LW	5yr	$1075	$1175

MegaHaus is the first company to sell the new Quantum Approved Audio Visual drives specifically tuned to meet demanding A/V applications.

ULTRA 2 SCSI A/V (Minimum sustained 10MB/sec)

4550MB	7200rpm	512K	VK304550LV4	5yr	$325	$425
9100MB	7200rpm	512K	VK309100LV4	5yr	$549	$649
18200MB	7200rpm	1024K	XP318200LV4	5yr	$1109	$1209

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Capacity for the Extraordinary

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The professional's choice for backup. We will not be undersold on Quantum DLT Tape drives!

Native	Compressed	Internal	Table Top	Rack Mount
20GB	40GB	$2450 DLT4000	$2599 DLT4000QX	n/a
35GB	70GB	$5350 DLT7000	$5625 DLT7000QX	n/a
100GB	200GB	n/a	$3975 DLT4500	$3769 DLT4500R
140GB	280GB	n/a	$5589 DLT4700	$5389 DLT4700R
280GB	560GB	n/a	$10,499 DLT4114LST	$10,199 DLT4114LSR
490GB	980GB	n/a	$13,999 DLT7114ST	$13,699 DLT7114SR

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• CD RECORDERS •

Smart Storage Solutions CDR Drives Include:
- ✓ Toast Mastering Software
- ✓ 5 FREE disks
- ✓ Toll Free support

4x8 CDR $299

Smart STORAGE SOLUTIONS

Includes Toast & DirectCD Software!

DirectCD from Adaptec now makes a CD Recorder as easy to use as a hard drive.

Compare our price and you will see we are the #1 source for CD Recorders!

CD RECORDABLE Includes 5 Free Recordable Disks!	Internal	External
2x6 Sony mechanism, caddy load, 1MB buffer	$309	$369
4x6 Yamaha mechanism, tray load, 2MB buffer	$339	$399
4x8 Matsushita (Panasonic) mechanism, tray load, 1MB buffer	**$299**	**$359**
4x12 Teac mechanism, tray load, 1MB buffer	$399	$439
4x12 Plextor mechanism, caddy/tray load, 2MB buffer	$409	$469
NEW 8x20 tray load, 2MB buffer	$909	$969

PRICE BREAKTHRU

Stomper CD label kit only $39 with CD-R drive!

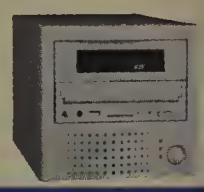
CD REWRITABLE Includes 5 Free ReWritable Disks!		
4x2x6 Yamaha mechanism, tray load, 2MB buffer	$399	$459
MacWorld Special external with only 1 CD-RW disk (SSS4X2X6XM1)		**$429**
CD-RW starter pack with 5 CD-RW disks and 10 CD-R disks (CDSTARTER)		**$95**

Adaptec Jam Pro Audio Software w/ Peak LE $289	Adaptec Bias Peak Software $499	Fargo Signature CD Printer $999	CD Duplicators Call for price.	CDStomper label kit $49

All-in-one CD Mastering

Duo Master is one of the most innovative CD mastering solutions available. The solution provides a hard drive, Jaz or Syjet drive and CDR in one unit. Create your master on the hard drive, Jaz or Syjet cartridge drive and then master directly to the CD. This is the perfect CD mastering setup! Includes 5 free recordable CDs (5 CD-RWs with CD-RW drives) and 1 free cartridge with Jaz or Syjet unit. Add these prices to the internal prices above.

Quantum 2GB (DUO2GBM)	$270	Quantum 4GB (DUO4GBM)	$340
Jaz 1GB (DUO1GBJAZM)	$330	Jaz 2GB (DUO2GBJAZM)	$530
Syjet 1.5GB (DUOSYJETM)	$350		



• SCSI HARD DRIVES •

Seagate

					Internal	External
4520MB	7200rpm	512K	ST34520N	3yr	$260	$320
4550MB	7200rpm	512K	ST34573N	5yr	$485	$545
6530MB	7200rpm	512K	ST36530N	3yr	$375	$435
9140MB	7200rpm	512K	ST39140N	3yr	$495	$555
9190MB	7200rpm	1024K	ST39173N	5yr	$605	$665
18200MB	7200rpm	1024K	ST118273N	5yr	$1120	$1180
ULTRA WIDE SCSI						
4520MB	7200rpm	512K	ST34520W	3yr	$270	$360
4550MB	7200rpm	512K	ST34573W	5yr	$480	$570
6530MB	7200rpm	512K	ST36530W	3yr	$375	$465
9140MB	7200rpm	512K	ST39140W	3yr	$495	$585
9190MB	7200rpm	1024K	ST39173W	5yr	$605	$695
18200MB	7200rpm	1024K	ST118273W	5yr	$1120	$1210
ULTRA 2 SCSI						
4550MB	7200rpm	1024K	ST34573LW	5yr	$495	$605
4550MB	10,000rpm	1024K	ST34502LW	5yr	$535	$645
9100MB	10,000rpm	1024K	ST39102LW	5yr	$720	$830
9190MB	10,000rpm	1024K	ST39173LW	5yr	$625	$735
18200MB	7200rpm	1024K	ST118273LW	5yr	$1125	$1235
18200MB	10,000rpm	1024K	ST118202LW	5yr	$1369	$1479

IBM

4550MB	5400rpm	512K	IBM34560N	5yr	$275	$335
9100MB	7200rpm	512K	IBM39130N	5yr	$525	$585
18200MB	7200rpm	1MB	IDGHS18Z	5yr	$1099	$1159
ULTRA WIDE SCSI						
4550MB	5400rpm	512K	IBM34560W	5yr	$275	$365
9100MB	7200rpm	512K	IBM39130W	5yr	$539	$629
9100MB	10020rpm	1MB	IDVGS9U	5yr	**$609**	**$699**
18200MB	7200rpm	1MB	IDGHS18U	5yr	$1099	$1189
ULTRA-2 SCSI						
9100MB	7200rpm	512K	IBM39130U2	5yr	$565	$675
18200MB	7200rpm	1MB	IDGHS18U2	5yr	$1155	$1265

FUJITSU

Check out these prices! Also NEW 10,000rpm Drives.

ULTRA WIDE SCSI						
4550MB	7200rpm	512K	M3045W	5yr	$319	$409
4550MB	10,000rpm	512K	M3045WP	5yr	$409	$499
9100MB	7200rpm	512K	M3091W	5yr	$499	$589
9100MB	10,000rpm	512K	M3091WP	5yr	$659	$749
18200MB	7200rpm	512K	M3182SW	5yr	$1029	$1119

• CD ROM DRIVES •

			Internal	External
16X- 5 disc changer	Nakamichi	MJS16M/XM	$189	$249
32X - Slot load	Pioneer	DRX32SM/XM	$90	$150
32X - Tray load	Toshiba	XM6201BM/XM	$105	$165
32X - 512K buffer	Plextor	PX32TSM/XM	$148	$208
36X - Slot load	Pioneer	DRU706M/XM	$95	$155

• MISCELLANEOUS •

IOMEGA 1GB Jaz	JAZX	$269
IOMEGA 2GB Jaz	JAZ2X	$339
SYQUEST 1.5GB Ask about rebate	SYJET1.5MAC	$279
ADAPTEC Controllers		
PCI Wide Single Channel	A2940MUW	$225
PCI Wide Dual Channel	A3940MUW	$469
PCI FireWire + Wide SCSI	AHA8945	$639
PCI Ultra 2	A2940MU2W	$399
ATTO Controllers		
PCI Fibre Channel	ATTOPCIFC	$889
PCI Ultra 2 SCSI	ATTOPCIU2	$425
above w/ RAID software & cable	ATTOPCIU2K	$609
E4 Cool DVD Kit		
Complete kit for Mac G3 computers	DVDMAC	**$399**
Maxoptix Optical Drives		
2.6GB	T5-2600	$1149
5.2GB	T6-5200	$1499
Sony Optical Drives		
5.2GB	SMOF551	$1599
Fujitsu Optical Drives		
640MB (mail in offer for 3 disks until 9/30/98)	DYNAMO640SE	$329

• CDR MEDIA •

Nobody beats MegaHaus for CD Recordable Media prices! We will not be undersold. If by chance you do find a lower price, call us.

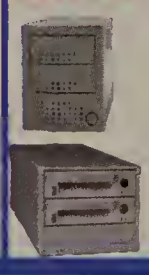
	CDR74	CDR74W	CDR74P
5 Pack	$21/$19	$96/$91	$28/$25
20 Pack	$42/$39	$360/$355	$65/$62
50 Pack	$93/$89	$859/$839	$139/$135
100 Pack	$175/$169	$1629/$1609	$259/$249
Budget 5 Pack	$19/$17	$80/$76	$24/$21
Budget 20 Pack	$36/$33	$299/$289	$55/$52
Budget 50 Pack	$74/$70	$699/$689	$119/$109
Budget 100 Pack	$139/$129	$1299/$1289	$189/$179

CDR74 is recordable, CDR74W is rewritable, CDR74P is printable. $ is alone/with CDR purchase. 8X certified, & Platinum now available.

• IDE HARD DRIVES •

3.5" ULTRA IDE					
6530MB	Seagate	7200rpm	ST36530A	3yr	$209
9140MB	Seagate	7200rpm	ST39140A	3yr	$255
10100MB	IBM	5400rpm	IBM10GP	3yr	$265
10100MB	IBM	7200rpm	IBM10GXP	3yr	$305
12900MB	IBM	5400rpm	IBM12GP	3yr	$385
14400MB	IBM	7200rpm	IBM14GXP	3yr	$499
16800MB	IBM	5400rpm	IBM16GP	3yr	$445
2.5" IDE for laptops					
4000MB	Toshiba	12.1mm	MK4006MAV	1yr	$279
5400MB	IBM	12.5mm	DA25400	3yr	$429
6480MB	IBM	12.5mm	DA26480	3yr	$489
6490MB	Toshiba	12.7mm	MK6409MAV	1yr	$499
8100MB	IBM	19mm	DP28100	2yr	$829

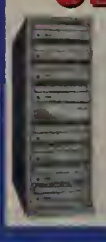
RAID



These preconfigured RAIDs can be run in RAID 0 or 1 mode. The capacity listed is for RAID 0 configuration. In RAID 0, the data is striped across a pair of drives. This is perfect for digital video such as Media 100, TrueVision, Avid, or other applications that require extremely high data transfer rates.
Includes - Ultra 2 LVD SCSI drives - Adaptec PCI Ultra-2 SCSI controller - Adaptec Remus Lite RAID software - Necessary cables

			Removable	Fixed
18GB	7,200rpm	2 9.1GB Quantum Viking drives	$1839	$1639
18GB	7,200rpm	2 9.1GB Quantum Atlas drives	$2069	$1869
18GB	7,200rpm	2 9.1GB Seagate Barracuda drives	$2079	$1879
18GB	10,000rpm	2 9.1GB Seagate Cheetah drives	$2289	$2089
36GB	7,200rpm	2 18GB Quantum Atlas drives	$2979	$2779
36GB	7,200rpm	2 18GB Seagate Barracuda drives	$3099	$2899
36GB	10,000rpm	2 18GB Seagate Cheetah drives	$3599	$3399

NETWORK READY CD TOWER



Connects directly to your Ethernet network. Easy to install. Auto switches between 10 and 100Mbps networks. Also has built-in http support for easy connection to Internet. Includes 8 32X drives SSS32X8N $1799

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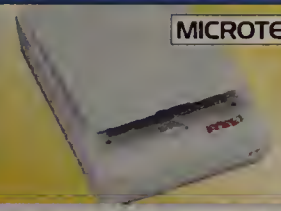
TDK CyberExpress 3000 (33.6K PCMCICA) (TDK U63000080) $79.99
U.S. Rabatics External V.90 (S6K) (USR EXTMACS6V90) $139.99

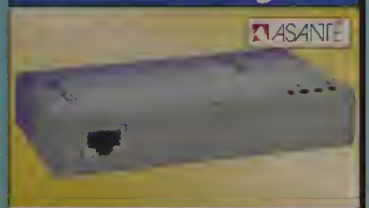
Scanners



Microtek ScanMaker E3+
30-Bit Color Scanner
•300 x 600 dpi •8.5" x 13.5" scan area
$129.99 (MTK SCANE3+MAC)

UMAX Transparency Adapter (UMX IPOV-2121B) $199.99
UMAX Astro 1200S Duo Deluxe (30-bit) (UMX AST12DUODLX) . . . . . $199.99, after $50 mfg. rebate (exp. 10/31/98)
Epson Expression 636 Artist (36-bit, 600-dpi) (EPS 636-AMAC) $999.99

Networking



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Office 98 upgrade by Microsoft $264.99
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TechTool Pro by Micromat $89.99
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64MB RAM, 4GB hard drive .....(APP M7110LL/A) $3499.99

300MHz with 14.1" TFT Display
64MB RAM, 8GB hard drive .....(APP M7111LL/A) $4999.99

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G3 Minitowers (monitors sold separately)

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333MHz 128MB RAM, 9GB Ultra/Wide SCSI drive, 24x CD-ROM drive, Ethernet, 6MB SGRAM graphics ..... (APP M7106LL/A) $2999.99

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128MB (PNY PAPMG3WS128) . . . . . $269.99, after $30 PNY Rebate

(for G3 Desktops & MiniTowers)
32MB (PNY PAPMG332CS) . . . . . $49.99, after $10 PNY Rebate
64MB (PNY PAPMG364CS) . . . . . $129.99, after $20 PNY Rebate
128MB (PNY PAPMG3128CS) . . . . . $199.99, after $30 PNY Rebate

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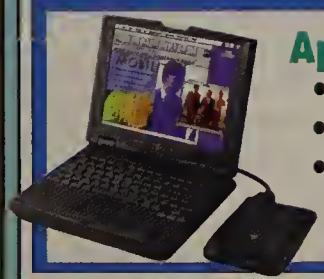

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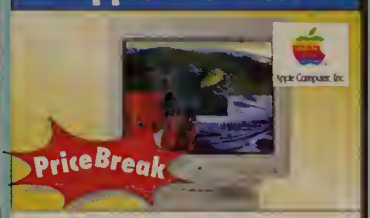

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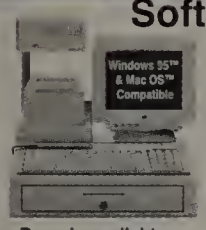

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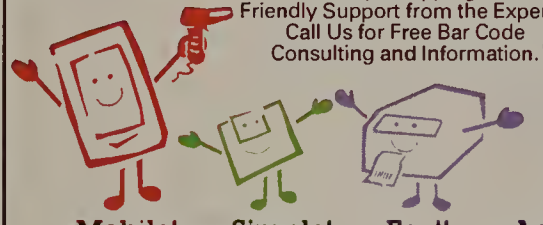

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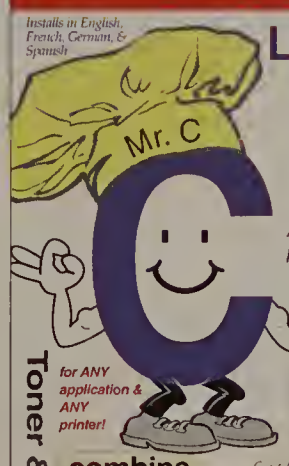

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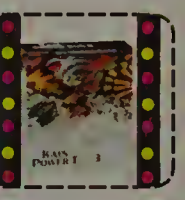

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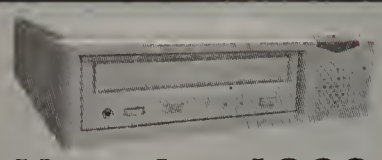

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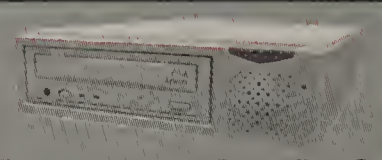

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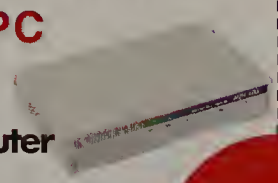

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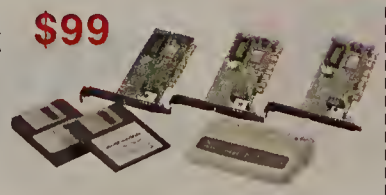

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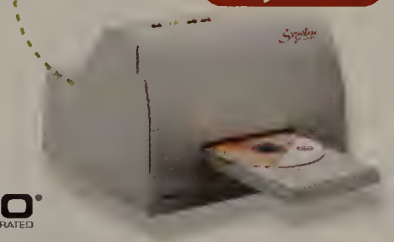

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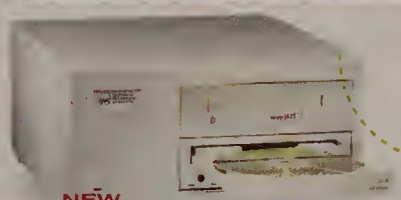

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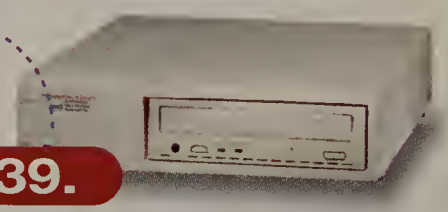

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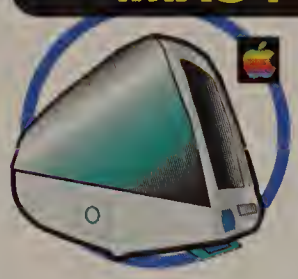

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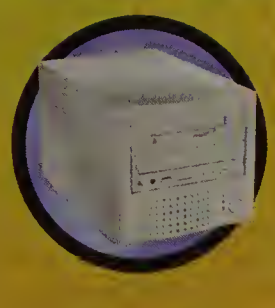

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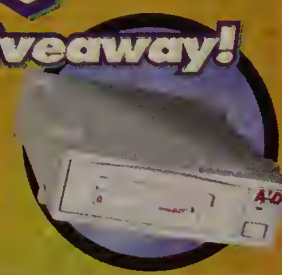

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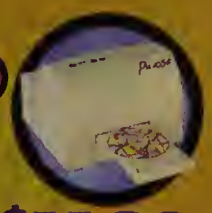

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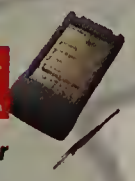

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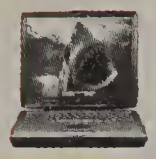

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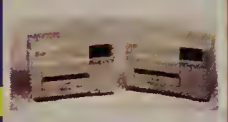

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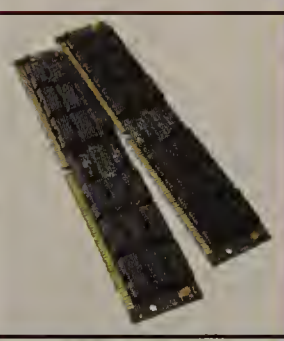

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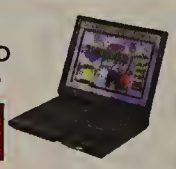

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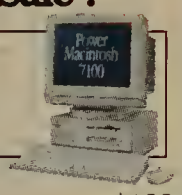

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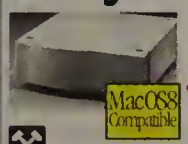

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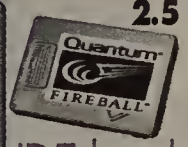

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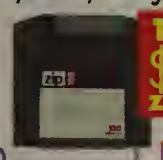

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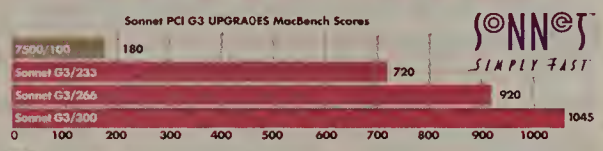

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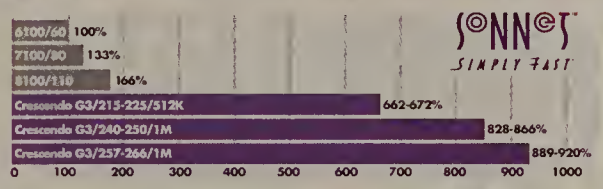

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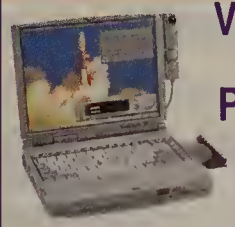

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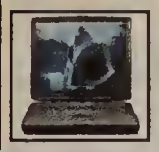

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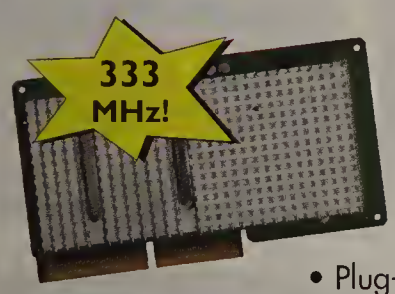

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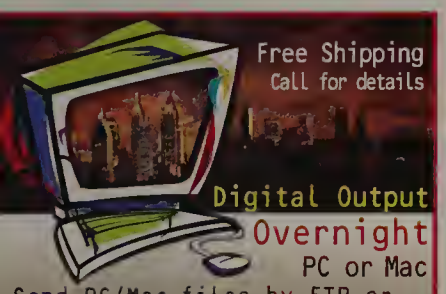

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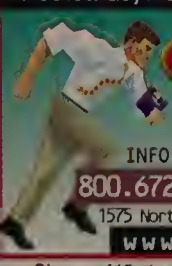

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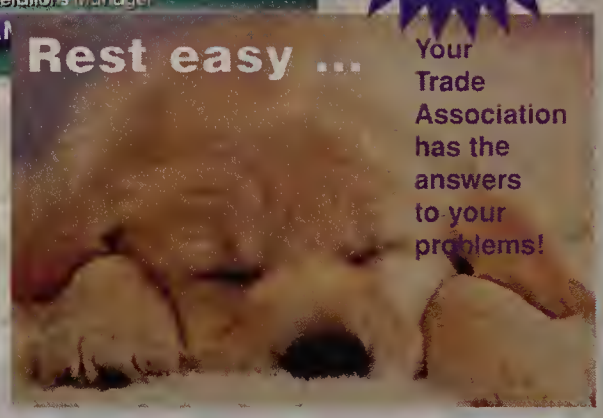

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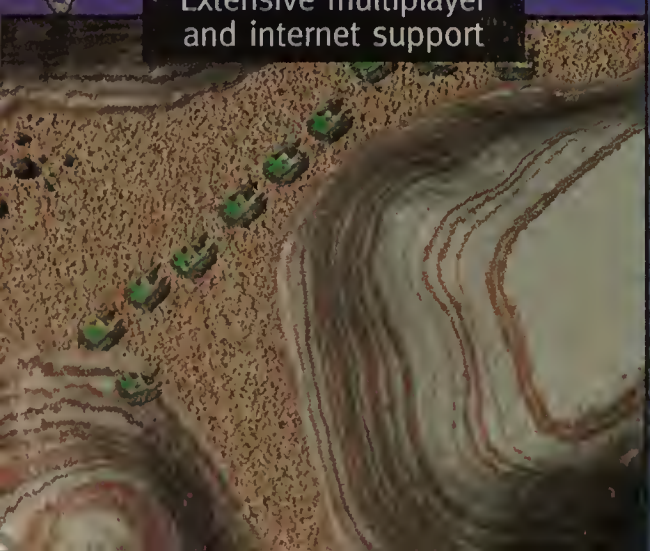

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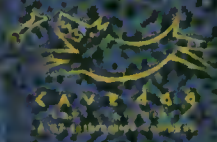

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Take Control

These Game Controllers Put the Action in the Palm of Your Hand

by Stephen Beale

LET'S FACE IT: IF YOU'RE AXING aliens on a distant planet or blasting bogeys in an F-16, you don't want to entrust your life to a boring old mouse. You need an input device that puts you smack-dab in the middle of the action. But choosing the right controller for the way you game can be as daunting as jumping into a Quake frag-fest against a 13-year-old metal-head. Are you better off with a joystick or a game pad? Which devices give you an edge, and which are just awkward?

Macworld's gaming experts gathered in the Lab and spent several fast-and-furious days duking it out with a host of popular games. We wanted to see which game controllers outgunned, outdrove, and outflew the rest. (It was a tough job, but hey—someone had to do it.) Here's what we found.

ILLUSTRATION BY JONATHAN CARLSON

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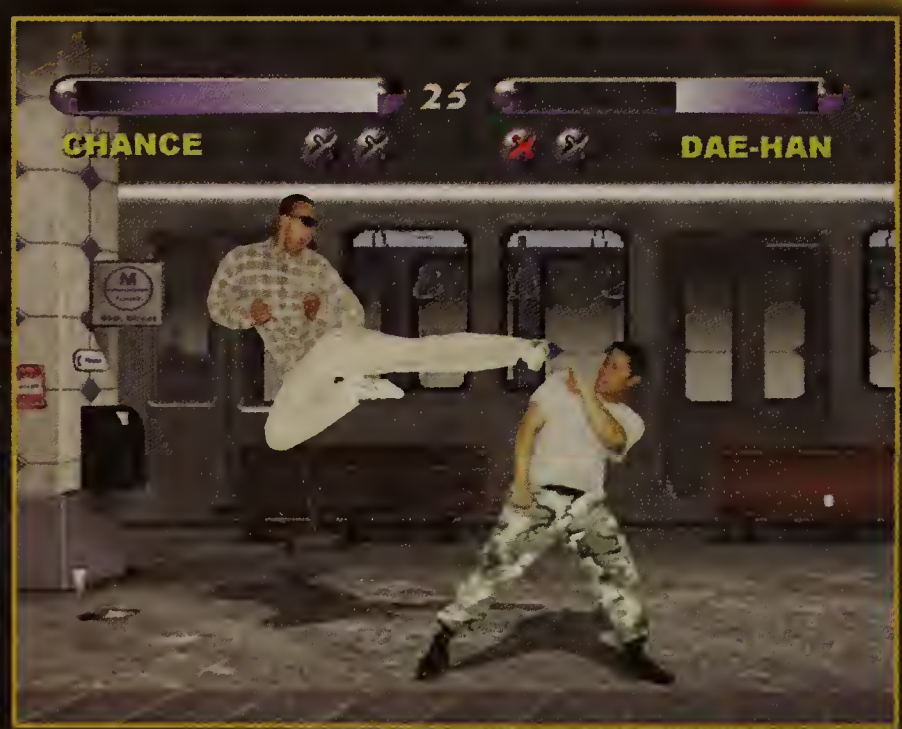

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Joysticks

STILL FLYING YOUR FAVORITE GAMES with a device that looks like a swizzle stick stuck in a soap dish? My God, man! Get with the times! These days, you can pilot your virtual aircraft with a replica of an authentic F-16 joystick, complete with throttle controls and programmable buttons.

In addition, many modern sticks include features like the *hat*, which allows you to switch views and perform other functions. You also get software that lets you save button configurations for specific games.

Joysticks are ideal for flight simulators and other games in which you navigate a 3-D environment. The best give you precise control over game actions, providing just the right amount of resistance so you don't overshoot your targets. A good joystick also features well-placed buttons and straightforward software that makes it easy to customize the stick for your favorite games.

Much to our dismay, we found that there are no truly outstanding joysticks for the Mac. Most have a cheap, toylike feel and suffer from at least a few flaws, such as unresponsive stick movement, poor button placement, or quirky software. But we did find several that offer a realistic gaming experience without breaking the bank.

The best of the lot is the $89.95 Mac Firebird 2 from Advanced Gravis Computer Technology. We liked the stick's responsiveness, and its 13 programmable buttons let you play almost any game without reaching for the keyboard. Gravis's control-panel software makes it easy to assign keystrokes to buttons.

Mac Firebird 2

♦♦♦♦ The most responsive stick of the bunch, the Firebird 2 has 13 programmable buttons that allow you to play almost any game without reaching for the keyboard. **Company:** Advanced Gravis Computer Technology (650/572-2700, www.gravis.com). **List price:** $89.95.

F-16 Fighterstick

♦♦♦ With 24 programmable controls, the F-16 Fighterstick really puts you in the pilot's seat. Unfortunately, you need to be a contortionist to reach all the buttons effectively. **Company:** CH Products (760/598-2518, www.chproducts.com). **List price:** $189.95.

FX 3000

♦♦♦ This stripped-down stick has a decent feel and an affordable price but few additional controls. **Company:** Suncom (847/229-0002, www.suncominc.com). **List price:** $39.99.

Mac Blackhawk

♦♦♦ Slow throttle response and a sticky trigger mar this otherwise solid-feeling stick. **Company:** Advanced Gravis Computer Technology (650/572-2700, www.gravis.com). **List price:** $69.95.

SideWinder 3D Pro

♦♦♦ The SideWinder 3D Pro twists on its base—which can give you the flexibility to glance over your shoulder while dashing down a dark corridor. **Company:** Microsoft (425/882-8080, www.microsoft.com/sidewinder/). **List price:** $94.95.

PHOTOGRAPHS BY ARNOLD TIOSEJO

On the downside, with its large black plastic platform, the Firebird 2 consumes more desktop real estate than any of the other joysticks.

The $87 Flightstick Pro from CH Products—a mainstay for Mac gamers—offers good response and a simple button layout. But the throttle control is too close to the joystick's handgrip; you could easily smash your finger in the heat of gaming action. The pricey $189.95 F-16 Fighterstick from CH also offers good response, plus a total of 24 programmable controls. However, the controls are not well arranged, forcing you to stretch your hand to hit the trigger.

Among the other joysticks we tested, the $94.95 SideWinder 3D Pro from Microsoft offers a unique motion: the stick twists in addition to moving side to side and front to back. However, some of the buttons are poorly arranged, and it's the only joystick that forces you to run the setup software while playing the game.

The Macintosh Flight Control System, from ThrustMaster—designed after the joystick in the F-4 Phantom fighter—carries a hefty price tag of $149.95. It has a reasonably good feel but few programmable buttons. We also found the base too light, forcing us to hold it down during game play.

The $69.95 Mac Blackhawk from Advanced Gravis has a decent feel, but the throttle has a slow response and the trigger button is a bit sticky. Gravis's $44.95 Mac Mouse Stick II feels cheap and offers few programmable buttons.

Bargain-hunters might consider the $39.99 FX 3000 from Suncom, which has a responsive joystick but few other controls. The software is difficult to use, and only a handful of games have preconfigured settings—but it's by far the cheapest joystick of those we tested.

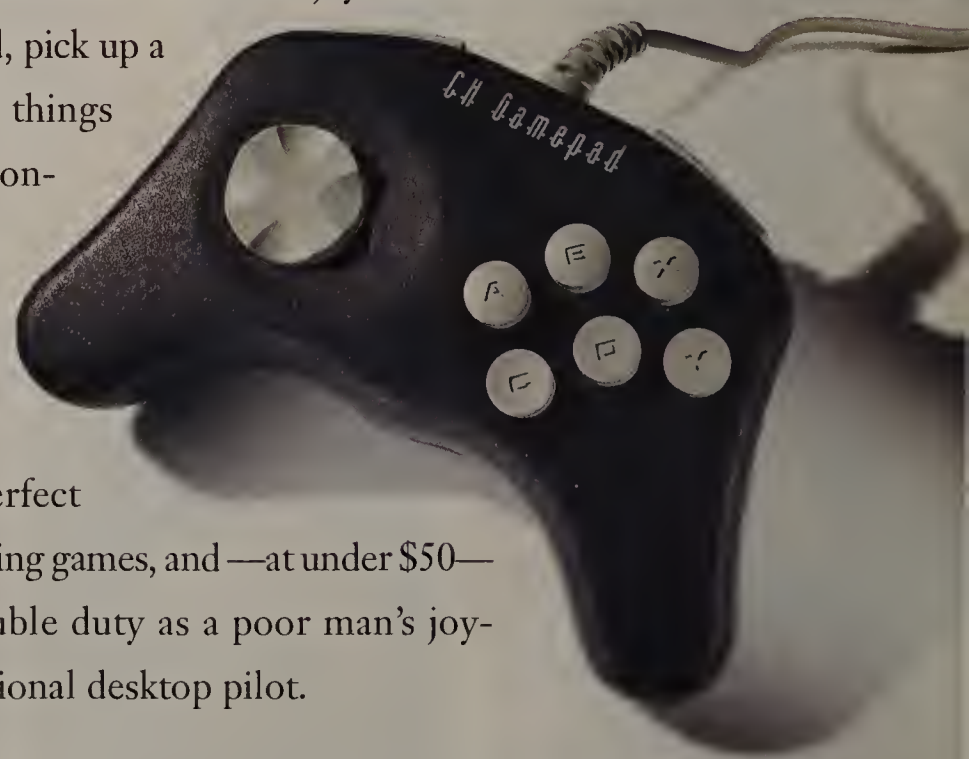
Flightstick Pro
♦♦½ A mainstay for Mac gamers, the Flightstick Pro offers good response and a simple button layout. It's too easy to catch a finger between the handgrip and the throttle, however. **Company:** CH Products (760/598-2518, www.chproducts.com). **List price:** $87.

Macintosh Flight Control System
♦♦½ Designed after the F-4 jet's joystick, the Flight Control System has a good feel . . . and a hefty price. **Company:** ThrustMaster (503/615-3200, www.thrustmaster.com). **List price:** $149.95.

Mac MouseStick II
♦♦½ The MouseStick II feels cheap and offers little programmability. Other products reviewed here offer more for the money. **Company:** Advanced Gravis Computer Technology (650/572 -2700, www.gravis.com). **List price:** $44.95.

Game Pads

IF YOU'RE INTO ARCADE-STYLE GAMES, controlling the action with a full-blown joystick can be overkill. Instead, pick up a game pad. These things resemble the controllers that come with Nintendo and Sega game consoles for a reason: they're perfect for sports and fighting games, and —at under $50— can do decent double duty as a poor man's joystick for the occasional desktop pilot.



While joysticks can be operated with one hand, you need two to work a game pad. That means you won't have access to the keyboard, so the game pad should have enough buttons for all the commands you might use in a game.

That's the big advantage of the $49.95 Mac CH Gamepad from CH Products, which is modeled closely after the Sega Saturn game pad. It gives you a total of 16 programmable functions: an 8-way hat switch plus 6 buttons on top and 2 buttons on the side. Because it moves in

Mac CH Gamepad
♦♦♦♦ Similar to the Sega Saturn game pad, CH's version offers 16 programmable functions and a solid feel. **Company:** CH Products (760/598-2518, www.chproducts.com). **List price:** $49.95.

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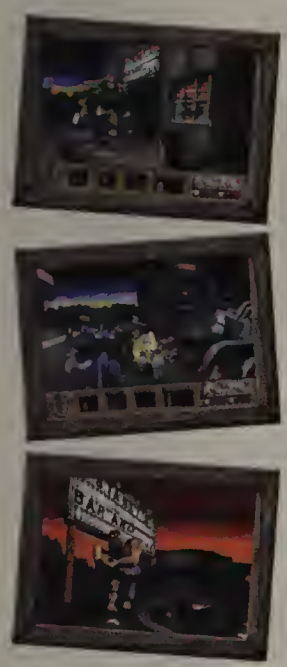

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"Tempest 2000 is quite literally a jewel" -- Inside Mac Games

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SFX Plus

♦♦♦ The SFX Plus features a switch that allows the unit to be programmed with preferences for two users, so you can quickly pass it back and forth and still have it set up for the way you play. **Company:** Suncom (847/229-0002, www.suncominc.com). **List price:** $39.99.

Mac GamePad

♦♦½ The directional control hat on the Gravis Gamepad is top-notch. Unfortunately, it includes only four buttons, so it's tough to use with games that require more control. **Company:** Advanced Gravis Computer Technology (650/572-2700, www.gravis.com). **List price:** $34.95.

eight directions, the hat switch can be a bit tricky to master, but the software lets you restrict the movement to four directions. The entire unit fits the hands well.

The $39.99 SFX Plus game pad from Suncom gives you eight controls and is easy to set up. You can also set preferences for two users, which is great for hot-seat games where you have to quickly sit in for another player. However, the hat switch is poorly designed and doesn't fit the thumb well; it's also not as responsive as the hats in the other game pads we tested.

The hat is the best aspect of the $34.95 Mac GamePad from Advanced Gravis. It is very responsive and gives you more navigational control than the other game-pad hats do. Unfortunately, the pad includes only four programmable buttons, making it essentially unusable with any game that requires a greater number of controls.

Macworld's Buying Advice

If you want to feel as if you're at the controls of a flight simulator or first-person shooter, a joystick is your best bet. Standing out from the fleet is the $89.95 Mac Firebird 2 from Advanced Gravis, which has good response and 13 programmable buttons. If you're on a budget, consider the $39.99 FX 3000 from Suncom, which also responds well but lacks many bells and whistles.

Game pads are good general-purpose controllers and tend to be less costly than joysticks. Our favorite here is the $49.95 Mac CH Gamepad from CH Products, which offers an eight-way hat switch plus six other buttons. m

---

Senior Editor STEPHEN BEALE was last seen steering his F-16 fighter toward Redmond, Washington.

Take a Spin

JOYSTICKS AND GAME PADS are great for playing Quake or Myth, but when you're hitting the curves in the Indy 500, you want your foot on the gas pedal and your hands on the steering wheel.

Designed for use with Sierra's Indycar Racing and NASCAR Racing, as well as other driving games, the Formula T2 Advanced Racing System, from ThrustMaster ($179.95; 503/615-3200, www.thrustmaster.com), consists of a steering-wheel console plus gas and brake pedals, all of which plug into your Mac's ADB connector.

The console, which also includes a gear shift and two dashboard buttons, attaches to your desk by means of clamps and suction cups. The gas and brake pedals are mounted on a sloping platform that sits on the floor.

The steering wheel has a comfortable cushion grip and offers just the right amount of resistance. But eat your Wheaties before installing the unit—good drivers need finesse, but getting the wheel to fit on the spindle requires brute strength.

The hardware is solidly constructed of metal and heavy-duty plastic; it almost feels as if you're driving a real car. The only major weaknesses are the clamps and suction cups on the console, which tend to come loose as you keep turning the wheel.

If you're the Walter Mitty of NASCAR racing, no joystick or game pad will give you the authentic driving experience of a real steering wheel. On the other hand, $179.95 is a lot to pay for a device that's only worthwhile for racing games. If racing's your thing, take a close look at the Formula T2 system. Otherwise, try to make do with a more general-purpose game controller.

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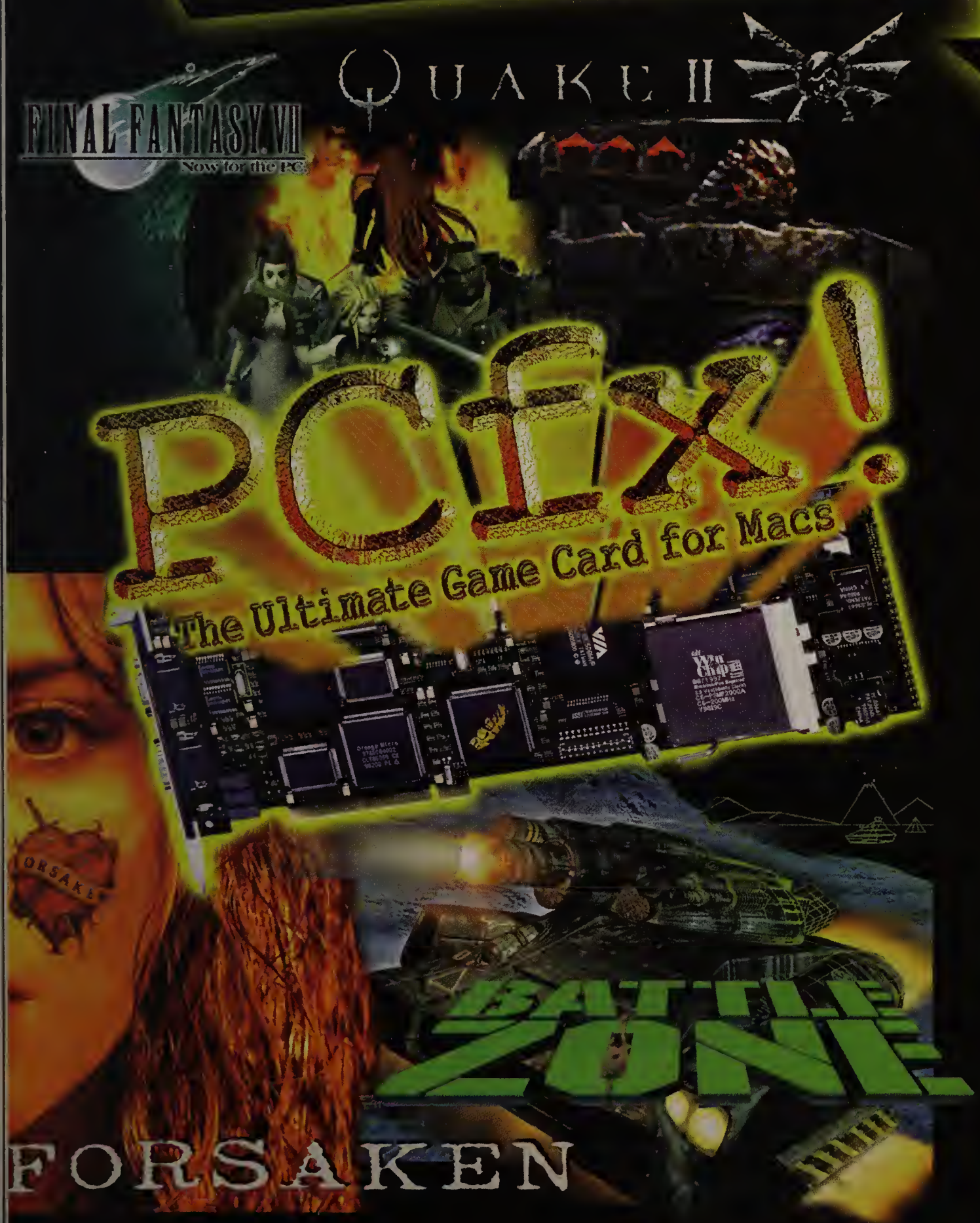

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The Game Room

by Philip Dyer

Mac Games Get Down to Business

APPLE PRESCRIBES SERIOUS FUN FOR A SICKLY GAME INDUSTRY

CAN YOU FEEL THAT? No, not that. I'm talking about the sudden surge of energy that is revitalizing the Macintosh gaming industry. After far too many lean years, the tide is finally turning in favor of the gamers. How has Apple pulled this off? Simple: by making its platform attractive to game publishers.

OK, so maybe that wasn't such a simple answer. In fact, it has taken a great deal of effort and some hard decisions to turn the Macintosh into an attractive gaming platform again. Tony Lee, Apple's director of Consumer, Education, and SOHO, has never seen more emphasis on games than over the past few months. "When I started nine years ago, we didn't want the Mac to be perceived as a machine for games, because we didn't want people to think that the Mac was a toy," he says. Now, with the introduction of the iMac, the move to Universal Serial Bus (USB) ports, and a changing attitude toward game publishers, Apple is finally positioning itself as a compelling game platform. So what does all this mean to you, the avid Mac gamer? More, bigger, better, faster, cooler games—now!

The iMac's Impact

The most obvious sign of Apple's rededication to the consumer market is the iMac. Michael Rogers, president of Aspyr Media (producer of the Tomb Raider series), is absolutely giddy about Apple's release of such a fast, affordable product. "To us, the only important number is the number of machines that Apple sells. With the iMac, they are clearly trying to increase their installed base. I couldn't be more pleased about the iMac," he says. This sentiment is widely echoed throughout the game industry, since the biggest complaint by game publishers has been that the Mac market just doesn't generate as much revenue as the PC market.

But the increase in Macs out there, and by extension the number of potential Mac gamers, is not the only benefit that the iMac brings to the Mac gaming industry. Apple's decision to switch to USB ports for the iMac and future Macs means that USB input devices will need only a Mac software driver to make the leap over to our platform. Now all those manufacturers of joysticks, game pads, and other input devices don't have to go to the trouble of making an ADB-compatible product just for Mac users. Many, if not most, of the coolest USB products will be simultaneously available for both platforms, so Mac gamers will finally have access to the best input devices as soon as they are introduced.

JAMES YANG

Attitude Adjustment

Even more important than hardware changes has been the drastic change in attitude emanating from Cupertino over the past several months. Gone are the days when Apple sent "evangelists" to persuade game publishers to bring their products to the Mac platform simply because "it's the right thing to do." Those evangelists of yesteryear now go by the moniker "partnership managers," and the only message they preach is one of market growth and profit.

In addition to focusing on the bottom line, Apple has stepped up its support for game publishers by providing both technological and marketing assistance. Cindy Swanson, marketing director of MacSoft, says, "After speaking with Apple engineers at a recent games summit, a member of our Unreal team was able to increase the speed of the game by 15 percent." She also praises Apple for its assistance in getting products to market and says this will help MacSoft achieve its goal of same-day releases for its PC and Mac products.

While the Mac gaming industry still has a long way to go, it is definitely experiencing a Lazarus-like comeback. Many new game titles, as well as several USB-compatible joysticks and game pads, have been announced since the introduction of the iMac (you'll find a list at www.apple.com/imac/). If iMac sales live up to Apple's predictions, we could see an even larger wave of new games and gaming peripherals rushing into the Mac market to meet the demand. Any way you look at it, now is a good time to be a Mac gamer. m

Senior Editor Online PHILIP DYER spends far too much time "researching" Mac gaming.

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The Desktop Critic

by David Pogue

Speech Impediments

WHY MAC DICTATION SOFTWARE COULD BE GOING THE WAY OF THE DINOSAUR

IN GENERAL, YOUR BODY IS A masterpiece of design. If it were subject to government standards, however, one element would surely be recalled: the wrist. An appalling number of nerves, vessels, and tendons are crammed inside. When something goes wrong, hideous pain can occur. Whenever my wrist problems have flared, I've used Articulate Systems' (781/935-5656, www.artsys.com) PowerSecretary, the Mac's lone, aging speech-dictation program, which is slated for cancellation.

PowerSecretary got me through trying times, but it has its drawbacks. Using it is not as fast as typing, it needs 13MB of RAM, and—because you wear a headset and speak with pauses between words—its halting speech pattern gets into your blood. More than once I accidentally greeted my wife: "Hi . . . honey . . . comma . . . how . . . was . . . work?"

I'd heard nothing but raves about Naturally Speaking—*continuous* dictation software from Articulate Systems' parent company, Dragon Systems (617/965-5200, www.dragonsystems.com)—a product for Windows machines only.

Lo and behold, NatSpeak really works. After 45 minutes of training, you can speak at full speed, watching your words fly onto the screen as you finish each sentence.

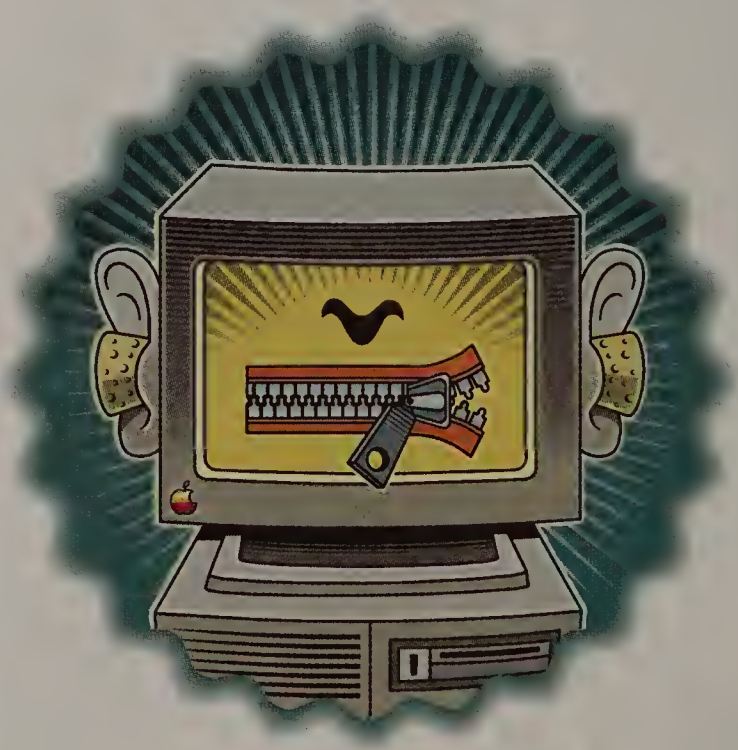
NatSpeak isn't perfect, of course. It gets about 1 in 20 words wrong, often in ingenious ways (transcribing *finely* for *finally*, for example). It also transfers the speed bottleneck to a new place: your brain. The program transcribes each phrase once you stop speaking—if you utter short bursts, it has no context and its accuracy plummets. As a result, you find yourself babbling on like a bad Macworld Expo speaker.

Yet NatSpeak is clearly the wave of the future. It's a megahit in the Windows world, selling 250,000 copies *per month*. Which practically screams: "Where's the dictation software for the Mac?"

Don't give me that old "the Mac market's too small" argument; Apple has sold 10 million Macs that are fast enough for dictation. If 1 in 20 Mac fans buys a copy, that's 500,000 copies.

The answer hinges on Andy Taylor, the former engineering lead on PowerSecretary. Ever since Dragon lost interest in the Mac, he's been chafing to bring back Mac dictation. To do that, he must overcome gigantic obstacles. He needs investor money, and he must license a *speech engine* (the underlying dictation technology) from IBM, Dragon, Phillips, or Kurzweil.

But the final obstacle is the scariest:



Apple Computer. In a way, Apple itself is responsible for the death of speech software on the Mac. Remember Articulate Systems' Voice Navigator? It let you manipulate menu commands by voice. But Apple finished off Voice Navigator when it introduced PlainTalk, a free system extension that did the same thing. Articulate Systems never fully recovered, and its parent company, Dragon, developed a wariness of the Mac platform that persists to this day.

Andy's greatest fear is that Apple itself is quietly working on a speech-recognition product. The rumor makes sense: the G3 chip's amazing speed could make speech recognition the Mac's new "killer app." Indeed, at the Worldwide Developers Conference in May, an Apple employee hinted that Andy "should find something else to work on."

Officially, of course, Apple says nothing. But what if the company really *is* working on making speech recognition part of the Mac OS? Andy's dictation program would die instantly—a replay of the Voice Navigator debacle.

These rumors, in large part, are responsible for the paralysis in the Mac speech market. Andy's search for funding and a speech engine is made more difficult as long as third parties remain skittish about Apple's intentions. Meanwhile, Apple could be planning nothing at all.

If enough people fill out Andy's survey at www.macspeech.com, he'll be able to convince the money and speech-engine people of the size of his potential market. And if enough Mac fans write to Dragon (info@dragonsys.com) to push for a Mac version of Naturally Speaking, the company might admit that it has experimented with compiling a Mac version.

Otherwise, the stalemate could continue. "At this point, I can't deliver [a Mac-based speech app] in less than six months, and that could mean never," Andy Taylor tells people. He's particularly pained on behalf of customers who *need* speech recognition, like people with hand and wrist problems. "Every time my screen beeps, it means another survey has come in from the Web site," he says. "It tears me up." **m**

DAVID POGUE (www.davidpogue.com) is the author of *Tales from the Tech Line* (Berkley, 1998).

PETER HOEY

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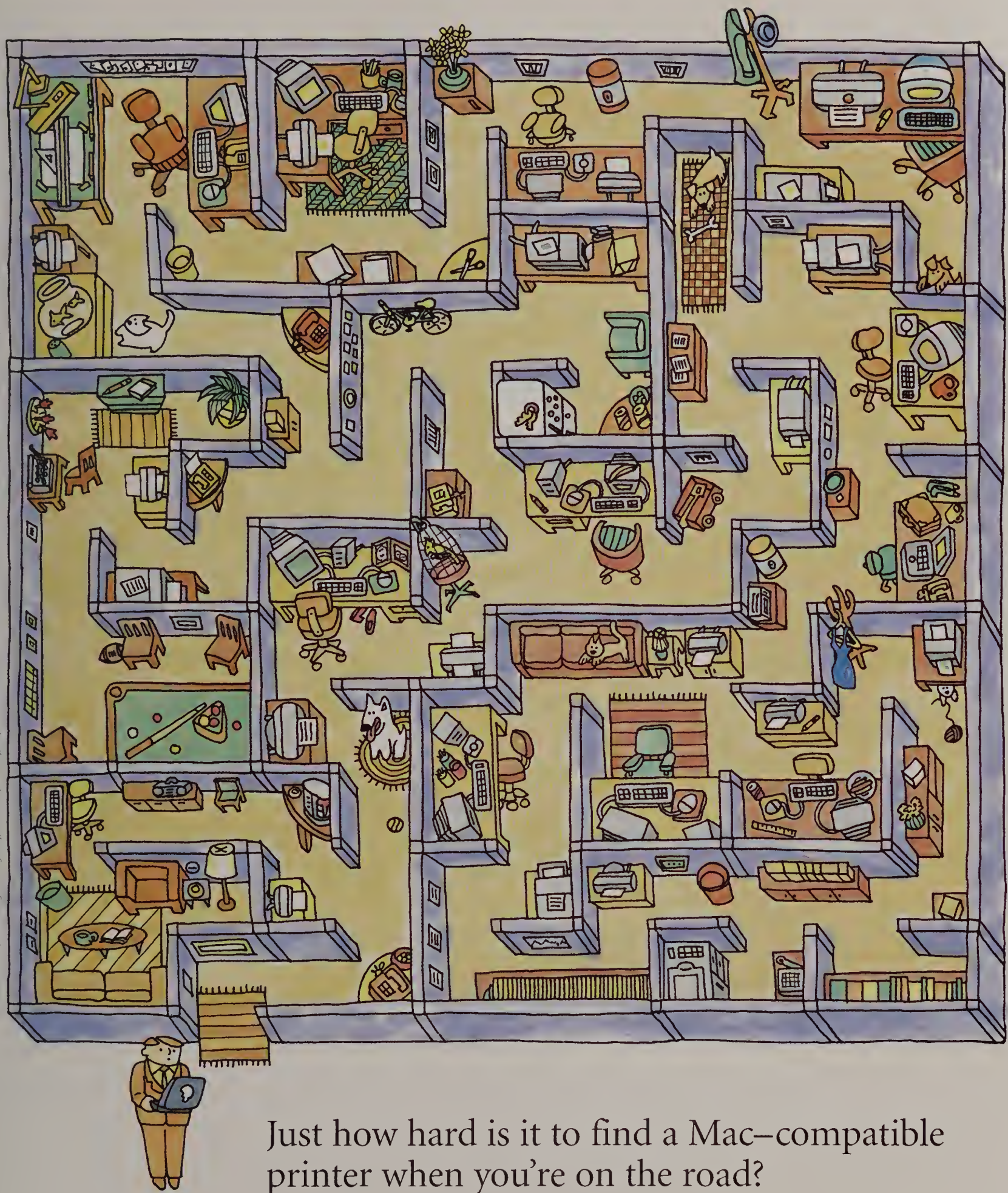

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